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The Dock & Harbour Authority

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Editorial Comments

The Port of Hull.

The town and river port of Hull is situated at the confluence of the rivers Hull and Humber on the N.E. coast of England, 20 miles from the open sea. It originated in the two nearly contiguous villages of Myton and Wyke, the latter of which grew to be a port of some importance not long after the Norman conquest. In 1298, Edward I, impressed with its potentialities as a commercial port, fortified it and changed its name to Kingston-upon-Hull. A year or so later, improvements to its harbour were put in hand and from that time its increase in prosperity and importance has been more or less uninterrupted.

As will be seen in the article on a following page, which has been kindly supplied by the British Railway Executive (N.E. Region), both the town and the port suffered from German air raids during the recent war, and it was a good thing for Britain's war effort that the damage at the docks, although severe, was not of such magnitude that it seriously disorganised the working of the port.

In addition to an important fishing industry, Hull is noted for its large timber trade, and the unique method of handling sawn wood from alongside ship, described in the article, is worthy of careful study.

Another feature of considerable importance to the port has been the revival of coal exports during the last few months, and it is interesting to note the wide area covered by the shipments. In addition to at least eight European countries, coal has been exported to America, New Zealand, India, Egypt and Africa. This gratifying increase in exports, welcome as it is, has also stressed the need for the re-equipment of the port's facilities, as there are not only fewer coal hoists in operation compared with 1939, but their general condition has deteriorated.

Rehabilitation of the port and of the cargo-handling appliances is being carried out as fast as present circumstances will allow, but major improvements are, unfortunately, being held up by the prevailing restrictions on capital expenditure. In view of the urgent need for a quicker turn-round of shipping at all United Kingdom ports, it is to be hoped that authority for work to proceed on the major rebuilding projects referred to in the article will not be long delayed.

Whangpoo Conservancy.

On a following page we reproduce an abstract of a recent report from Shanghai concerning the work of the Whangpoo Conservancy Board. This body, constituted in 1912, was up to the beginning of the War in 1937, one of the most successful undertakings of its kind. The Japanese severely restricted its operations, except so far as they were of military value to them, and seized much of its plant. Its installations were damaged by gunfire, and some were occupied. After the war, with the aid of the American forces, some of the plant was regained and the present report shows a remarkable degree of recovery.

The Whangpoo River, on which Shanghai is situated, needs a considerable amount of dredging to remain an efficient channel and to permit access to the deeper ship berths. Whilst the general regime is good by reason of the training works, at crossings, on spits and in shallows, there is a great deal of silting. In addition to the Whangpoo itself, there is also the sea approach to consider. Some years before the War a grand scheme of dredging the Yangtsze Bar was inaugurated and, under Dr. Chatley's management, had a considerable measure of success. One of two very large suction dredgers produced a deepening which was of great advantage to shipping and the second was ready to begin work when the war broke out, since then nothing has been done. Naturally the improvement in the Bar disappeared. One of the dredgers was in Danzig and has vanished. The other was taken to Japan and has only recently been reconditioned. Combined with the disastrous trade and currency conditions in China, the handicaps under which the Board has been working have been very severe.

Conclusions of Safety of Life at Sea Conference.

The final act drawn up at the recent International Conference on Safety of Life at Sea, which was held in London recently, was published on August 17th last by the Stationery Office. The publication contains the full text of the Convention which was drawn up by the Conference to take the place of the 1929 International Convention for Safety of Life at Sea, together with various annexes comprising proposals for the review of the Rules for Preventing Collisions at Sea, and the Recommendations and Resolutions of the Conference. The new Convention is to come into force on 1st January, 1951, provided that, 12 months before that date, 15 nations have accepted it. The 1948 Convention is in quite different form from the 1929 Convention and the main changes are as follows:—

Instead of the bureau work being carried out by the United Kingdom Government as hitherto, it is proposed to utilise, when set up, the Inter-Governmental Maritime Consultative Organisation, a specialised agency of the United Nations, which will also be used for discussing and effecting any future amendments to the Convention.

On ship construction there is no major change from 1929 in water-tight sub-division of ships, but much more comprehensive requirements have been laid down with regard to structural fire

Editorial Comments—continued

protection and fire fighting equipment to be carried on passenger ships. Requirements have also been included to preserve the stability of passenger ships in damaged condition, and the existing provisions relating to stability tests for passenger ships will apply also to cargo ships.

The main change in regard to life-saving appliances is that requirements will be applied not only to passenger ships but to all cargo ships of 500 gross tons and upwards, which will be inspected every two years and supplied with a Safety Equipment Certificate covering not only life-saving appliances but fire appliances, lights, etc. There are also new provisions in respect to the carrying of lifeboats generally and the fitting of radio and mechanical power to them.

The biggest advance on the radio side is that in future a continuous watch on the distress frequency either by an operator or by auto-alarm must be maintained by all ships over 1,600 g.r.t. All cargo ships of between 500 and 1,600 gross tons must in future be fitted either with wireless telegraphy or wireless telephony, and all ships over 1,600 g.r.t. must carry direction finding apparatus.

A new chapter has been added to the regulations laying down a code of rules for the carriage of grain and setting out certain broad principles for the carriage of dangerous goods.

The revised Rules for Preventing Collisions at Sea closely follow those now in operation. The proposed rules will be circulated by the British Government to all Governments now operating the present rules, and, when substantial unanimity as to their acceptance has been obtained, a date will be fixed on which the new rules will come into force.

New Plimsoll Line Advocated.

In connection with the foregoing, it is appropriate to refer to the loss of the cargo ship, "Samkey," 7,219 tons, a ship sound in design and construction and well maintained, which was lost in a North Atlantic gale on January 31st last with a crew of 43, while in ballast to the extent of 1,500 tons of gravel.

The court of enquiry which examined the circumstances of the occurrence recalled that in 1944 the "Sameveron," another ship of the Samkey Liberty Ship class, listed to an angle of 55 degrees in heavy weather due to shifting of 2,025 tons of Thames gravel, through lack of "shifting boards" to prevent movement of that type of ballast.

The normal publicity accorded to such cases apparently was not given to the "Sameveron" occurrence and to this omission and errors of judgment in stowing the ballast in the "Samkey," also without the use of shifting boards, was ascribed the loss of that vessel.

Wherever the blame can be considered to rest for the loss of the "Samkey," there appear to be no definite rules as to how much ballast any ship should carry when light nor as to how it should be stowed.

The maximum load draft and the minimum freeboard allowable for any vessel are fixed in accordance with the recommendations of the Convention for the Safety of Life at Sea and are marked upon each side of a vessel by the Plimsoll Mark. Yet a top-heavy ship equally lacks stability, seaworthiness and manageability.

In this connection it appears that the question of determining light load lines for ships was dismissed as impracticable as far back as the year 1903. It is understood, however, that Merchant Navy officers, engineers and seamen are to again press for the establishment of a new international "Light Load" line for ships in addition to the "Plimsoll Deep Load" line.

The report of the enquiry recommends that orders should be given to prevent ballast being used without precautions being taken to prevent its shifting.

Mr. L. White (National Organiser of the Navigators and Engineer Officers' Union) remarks that whatever the method of ballasting, there should be a standard line—internationally recognised—to which a light ship must be ballasted down.

This seems to be a reasonable suggestion and it is to be hoped, whatever difficulties, technical or otherwise may be involved, that they will be overcome and the ballasting of ships sailing light put upon a more satisfactory basis.

Survey of Dock Amenities.

The Minister of Labour has requested the National Dock Labour Board to consider the measures necessary to ensure that all possible steps are taken to improve to the fullest extent practicable the amenities in the docks in so far as they affect working conditions of dockers.

The National Dock Labour Board have now informed the Minister that they have decided to prepare a survey and report on dock amenities in all United Kingdom ports. The matter is being treated as one of urgency, and the document outlining the material to be covered and the procedure to be adopted is being issued forthwith to the local boards set up under the scheme. The local boards will call into consultation the interested bodies, including the port authorities, and have been asked to present their report to the National Board within three months. After this a report based on the result of these investigations will be forwarded to the Minister.

From our experience of some of the ports of this country the survey of working conditions has been put in hand not before it was wanted, particularly in respect to shelter for dock labourers waiting to sign on for work or for pay purposes, lavatory and washing amenities and facilities for meals and refreshment.

On the other hand much was done in many of the larger ports during the war in regard to such arrangements, particularly as to canteen facilities.

The result of the investigations will be awaited with interest by all of those concerned.

Ship Fires and Explosion Hazards in Ports.

In consequence of the loss of tonnage caused by fires, mainly in passenger ships in ship repairer's hands, since the end of the war, the Ministry of Transport has set up a small working party to study and make proposals on the problems of fire-prevention and fire-fighting in ships in port.

The working party, which is meeting early this month, will consist of representatives of shipowners, shiprepairers, shipbuilders, shipbuilding and engineering unions, fire fighters and port interests, and the Government Departments concerned. Its task will be to examine the information available in the Ministry of Transport on fires in port and means of fire-prevention, and to formulate proposals for submission to a full conference of all the interests affected.

Prompted by recent disastrous explosions at Texas City and Brest, the British Government has also instituted an enquiry into the risks attaching to ammonium nitrate in bulk.

For this purpose Dune Island, near Heligoland, one of the post-war practice targets of the Royal Air Force will be used as an experimental station, to obtain information on the hazards of the material both during transportation and storage.

Arrangements for the trials have been made by the Ministry of Supply and during the trial period, which ends early this month, the Royal Air Force will suspend their normal practice bombing on the island. Three hundred tons of nitrate in drums will be used in the experiments.

The investigations will be exhaustive in scope, and as a result recommendations will be made as to precautionary measures which may seem to be desirable.

Oil Pollution in Coastal Waters.

An indication of the importance rightly attaching to the prevention of the discharge of oil in coastal navigable waters is afforded by a recent announcement in the American press that a conviction was obtained and a fine of $500 imposed in a Federal district court after the United States Coast Guard, the New York Harbour Supervisor and the United States Attorney's office had brought an action against agents of a large American ship which was observed discharging oil within a prohibited area within 60 miles of Ambrose Channel and "within coastal navigable waterways in violation of the Oil Pollution Act of 1924." The infringement was observed from a Coast Guard aeroplane and, as far as is known, this is the first oil pollution conviction to be made on evidence from an airborne witness. The name of the ship and of the agents upon whom the fine was imposed were withheld.

The Port of Hull

Description of a Progressive East Coast Port

By L. BALLAN, O.B.E., M.Inst.T.
(District Goods Manager, British Railways, Hull).

History

THE junction of the River Hull with the broad estuary of the river Humber 20 miles from the sea provides a natural site for a sea port. For over 800 years Hull has been a port of note, first under the name of Wyke, then as Kingston-upon-Hull, a title bestowed by King Edward I at the end of the 13th Century. Until the 18th Century all the shipping was dealt with in what is now called the Old Harbour at the mouth of the River Hull, and the Kingston-upon-Hull Corporation is still the Port Authority for that part of the port.

In 1774 the Hull Dock Company was formed to build a dock, which was opened in 1778, being one of the earliest in the country, and the access was through the Old Harbour. In the middle of the 19th Century this dock, which had become known as the "Old Dock" was re-named "Queen's Dock" in honour of Queen Victoria. The Hull Dock Company continued to provide additional docks, following at first the line of the old City Moat, forming an arc enclosing the old town, which was contained in the angle formed at the west side of the junction of the Rivers Hull and Humber.

Humber Dock was opened in 1809, Prince's Dock (first named Junction Dock) in 1829, Railway Dock in 1846, Victoria Dock in 1850, Albert Dock in 1869 and Wm. Wright Dock in 1880. Fish traffic has been kept to the west end of the Dock System, St. Andrew's Dock being opened in 1883 and the Extension in 1897. These Docks are still being used exclusively for the Fish Trade. Alexandra Dock was built by the Hull, Barnsley and West Riding Junction Railway and Dock Company, being opened in 1885. An extension to the Alexandra Dock was opened in 1899.

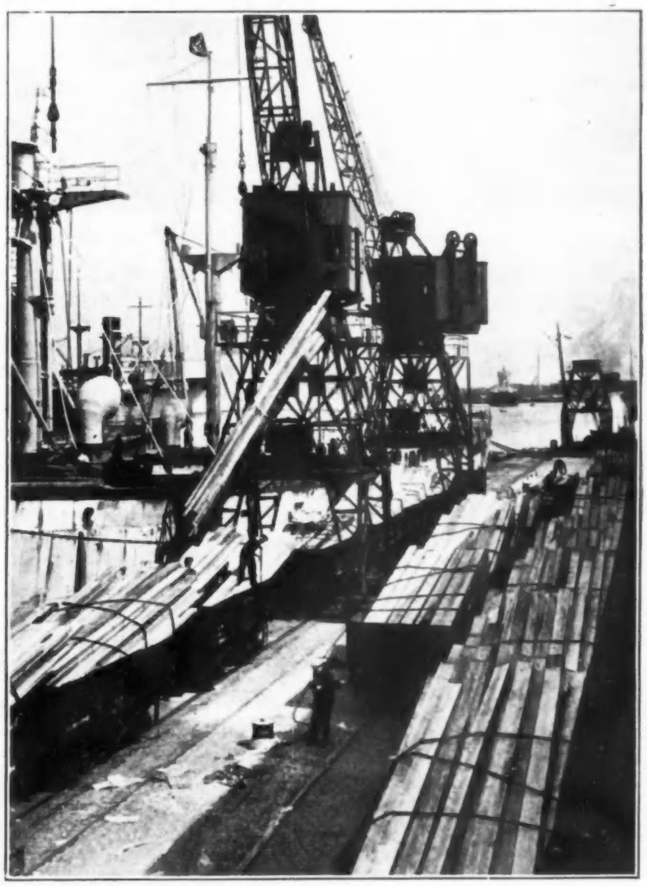
The first Railway into Hull was the Hull and Selby, opened in 1840, and the Directors of that Company held shares in the Hull Dock Company. Competition amongst the Railways themselves and between Railways and Waterways, coupled with the financial difficulties of the Hull Dock Company, led ultimately to the amalgamation of the Hull Dock Company with the North Eastern Railway in 1893, and in 1899 the Hull Joint Dock Act gave the North Eastern and the Hull and Barnsley Railway Companies jointly power to build a dock at the Eastern end of the dock system which, with a deep water Oil Jetty at Salt End, was opened in 1914.

In the meantime, the North Eastern Company had built the Riverside Quay, immediately south of Albert Dock, opened in 1907, with a minimum depth of water at L.W.O.S.T. of 16-ft. In 1910 the Hull and Barnsley Co., who were still in keen competition with the North Eastern, opened their River Pier at Alexandra Dock. This was much shorter than the North Eastern Riverside Quay, but the advertised depth of water was 18-ft. at L.W.O.S.T. and the Pier was provided with two coaling belts, whereas there were no coaling appliances at the North Eastern Riverside Quay.

Increasing traffic resulted in the opening of No. 2 deepwater Oil Jetty at Salt End in 1928. In 1930 Queen's Dock was closed and during the next four years it was filled in to form a public open space now known as Queen's Gardens.

It will thus be seen that the first Docks—Queen's, Humber, Prince's and Railway—developed conveniently as improvements on the Old Harbour. These Docks were soon found to be too small by reason of increasing trade and size of ships, and after Victoria Dock had been built at the east side of the Old Harbour, extensions were made towards the west along the foreshore of the Humber. By the time the Hull and Barnsley were ready with their scheme for a dock, ships had increased substantially in size and it was clear that further extension must be towards the Humber mouth, so that deeper water would be available.

Alexandra Dock was very well laid out and its excellent facilities for larger ships than could be handled by the old Hull Dock Company contributed to the strong urge for eastward development. Fierce rivalries among the Railways and the Dock Company finally resulted, after much argument, in the promotion of a joint scheme for a new deepwater dock east of Alexandra Dock. In July, 1914, King George V. opened the new Joint Dock which was named "King George Dock" after him. To a very considerable extent the Dock and its quay and storage space were made on ground reclaimed from riverside marsh land, and it is one of the finest docks on the East Coast.



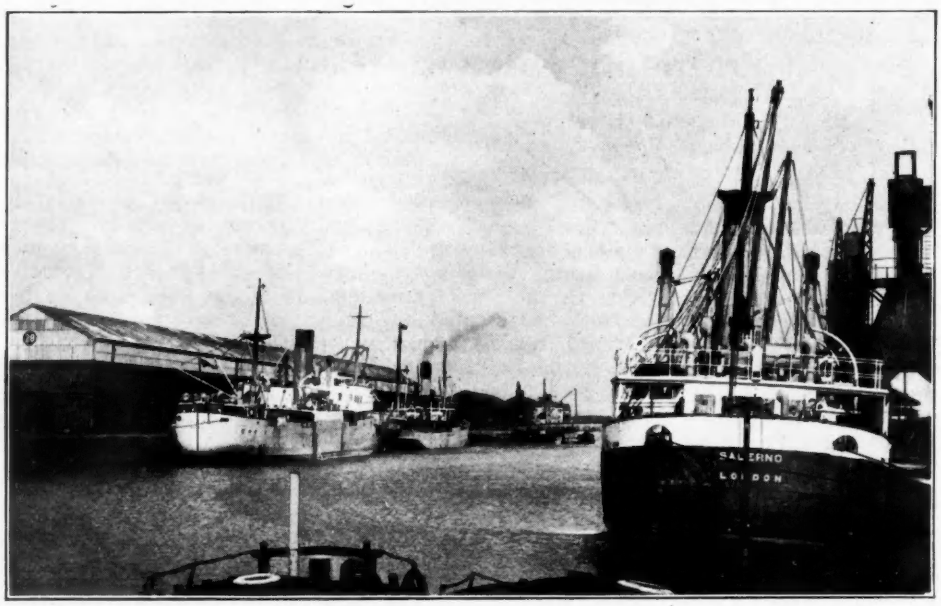
Discharging timber, King George Dock, Hull.

Description

The plan of the Hull Dock System (page 133) shows the layout of the Port, with a total River Humber frontage of about 7 miles. There are now eight Docks with a water area of 200 acres, 12 miles of quays and 300 miles of dock railways. There are 29 coal shipping appliances ranging from coaling cranes to modern coal hoists and belts with a capacity of as much as 800 tons per hour. There are 136 quay cranes of capacity from 30 cwt. to 40 tons, a 100-ton steam crane at Alexandra Dock, an 80 ton steam sheer legs at Albert Dock, and a floating self-propelled 80-ton steam-electric crane, normally employed in either King George or Alexandra Dock.

At the west end of the Dock System, St. Andrew's Dock and Extension have a water area of 19½ acres. Their equipment includes 4 Slipways and one side slip with a maximum capacity of 800 tons, and 6 cranes, one of which is specially built for

Port of Hull—continued



View of Wm. Wright Dock.

coaling trawlers, while the others can be used either for coaling or for general lifting purposes. The south side of the Dock is used for bunkering, voyage repairs, icing, shipment of stores, etc. All the fish is landed at the north side quays where, in normal times, it is sold by auction. Filleting is undertaken on the landing markets after the sales, the fish for despatch inland being loaded to railway wagons at the north side of the markets. Apart from local demand for fresh fish, there is also a heavy demand for fish for curing, kippered herrings, smoked haddock, smoked cod fillets, etc., being important products of the Hull Fishing Industry. The Hull Trade specialises in deepsea fishing, the trawlers penetrating to the Arctic Circle. Only a small proportion of the total fish landed is caught in the North Sea.

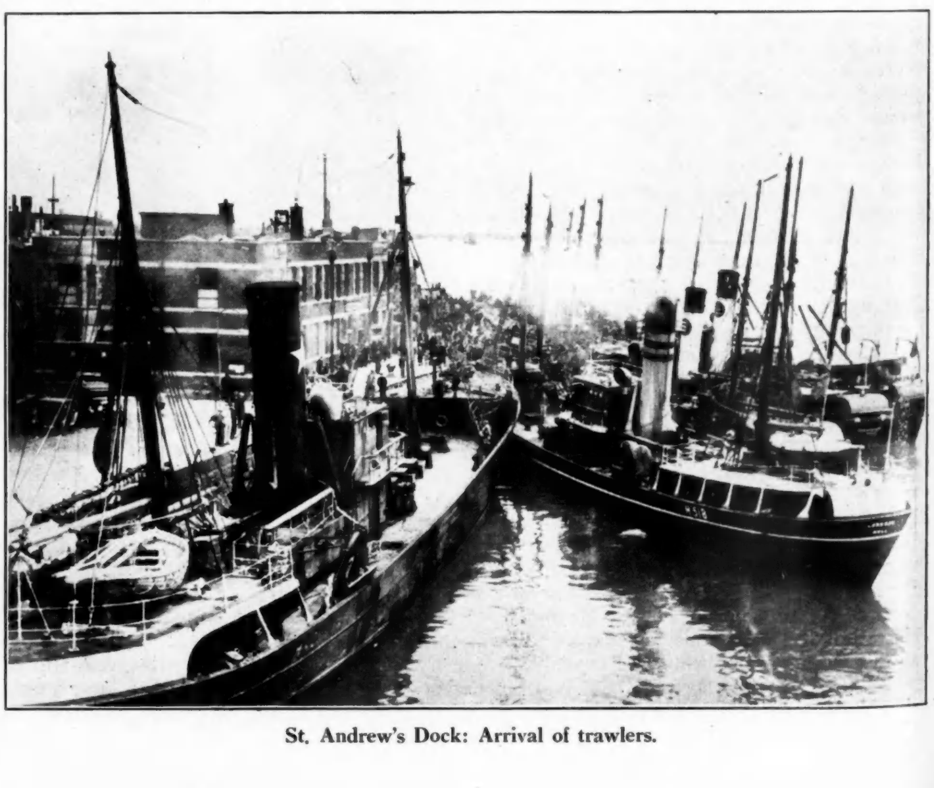
Some idea of the importance of the Fishing Industry to Hull is given by the fact that in 1947, **238,830** tons of fish were landed; **231,424** tons in **80,606** wagons were despatched inland by rail. Offal is converted on the Dock to fish meal and manure, and cod liver oil produced from livers boiled immediately after the fish are caught in the far distant fishing grounds is landed by means of tank barges to a Cod Liver Oil Refinery at St. Andrew's Dock. Thence it is conveyed by road tank car to the Marfleet factory of British Cod Liver Oil Producers, Ltd., who have a similar factory at Grimsby. After the final refining, standardising, blending, testing and packing, the oil is distributed as Seven Seas Cod Liver Oil throughout the world. About half the world output of Cod Liver Oil is produced in Hull and Grimsby.

The so-called Cod Farms lie west of the Slipways and were used for preparing salt fish dried by wind and sun, formerly exported in large quantities, but this trade was suspended during World War II and does not show signs of reviving. The buildings and drying grounds are now being used for various purposes connected with the Fish Trade in general.

Next come the Albert and Wm. Wright Docks, built as separate docks, but now forming one continuous sheet of water and counted as one. Here the Short-sea and Coasting traders are accommodated. There are limited crane facilities for direct working between ship and railway wagons and several heavy cranes can be used for coaling by lifting the railway wagon and tipping it over the ship. There are three coal hoists with speeds up to **600** tons per hour, all capable of handling **20**-ton wagons. The heavy cranes and the **80**-ton sheer legs are useful for fitting out trawlers, tugs and other small craft built at outlying shipyards, such as Beverley, Thorne, Selby and Goole, but engined and completed in Hull. There is a small dry dock and several useful transit sheds. Warehouse accommodation includes a Cold Store leased by the Union Cold Storage Co., Ltd.

Humber, Railway and Prince's Docks are called the " Town Docks," the city streets running alongside them. In Prince's Dock the fitting out of many of the trawlers is completed, apart from the heavy lifts. The Town Docks have been used for many years for the smaller ships in the Short-sea and Coasting Trades. Railway Dock was very badly damaged during the war and now accommodates sundry craft for which water space and limited quay space must be found. In addition to those at Albert and Wm. Wright Docks, substantial brick-built multi-storied warehouses, including bonded warehouses, are available at Prince's and Railway Docks, and there is a coal hoist at Humber Dock useful for bunkering, or for shipping parcels of coal in the Short-sea regular traders which make use of the transit sheds covering the greater part of the quays.

Before the Second World War, the Riverside Quay at the south side of the Albert Dock formed a very important section of the



St. Andrew's Dock: Arrival of trawlers.

Port of Hull—continued

western dock facilities, providing seven or eight berths for the discharge of perishable and other urgent cargo, such as fruit and provisions, some of which was discharged from ships on their way up the Humber to Goole. Passenger traffic also was handled at this quay, the complete destruction of which by enemy action in the May, 1941 Air Raids was a severe blow to Hull's peacetime traffic.

The banks of the River Hull, including the Old Harbour, are lined with industrial premises and wharves; warehouses and grain and oilseed mills predominate, but there are many other works of great importance, such as the paint, blue and edible oil factories. At low tide, the River becomes merely a large drain with scores of lighters, rivercraft, tugs and even a few small ships lying on the mud. At either side of high water the River is transformed into a valuable highway for small vessels of many kinds, including "dumb" craft, the crews of which skilfully use the tidal flow as motive power. Many rivercraft, however, and even some local lighters, are now self-propelled and can tow other craft.

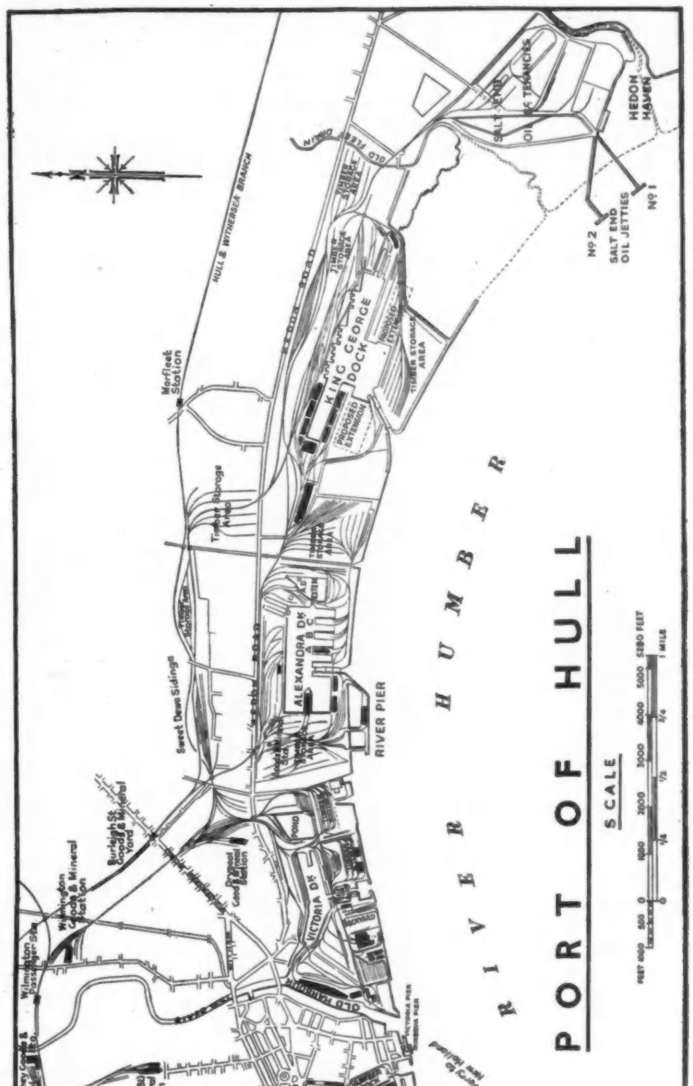
Lifting or swing bridges span the River at Drypool, North Bridge, Scott Street, Sculcoates and Stoneferry, and there are railway swing bridges at Wilmington and Bankside, carrying the old North Eastern and Hull and Barnsley Lines respectively. There was a bridge near the mouth of the Old Harbour called the South Bridge. This had been out of use for some years before the War owing to the toll receipts being insufficient to justify keeping it open; and in February 1945 it was removed, having been disposed of to the Ministry of Supply for scrap. The name is perpetuated in the Southbridge Road, running through part of the Citadel Estate.

Between the entrance to the Town Docks (Humber Dock Basin) and the mouth of the Old Harbour lies Victoria Pier, with a floating landing stage owned by the Corporation, and used for the New Holland—Hull Railway-owned Ferry Steamers.

Victoria Dock is mainly used for sawnwood, though there are small sheds and warehouses for general goods. Ships handle the cargo by means of their own derricks and winches, and most of the timber is removed from alongside ship by the bogie system, which is unique. These vehicles are simply wooden or metal frames, mounted on four small wheels, but running on normal railway track; the timber is loaded flat on to them projecting beyond the frames and for haulage they are coupled by 14-ft. lengths of 'rope strops''. After loading at stages alongside ship, to which the timber is landed by ship's gear, the bogies are hauled away by motor tractors, either to the adjacent stacking grounds, or into standage sidings, whence they can be transferred to merchants' yards later for stacking, or transhipment to wagon or road vehicle for distribution. The bogies are thus in effect portable quay space and storage ground. Additional advantages are that a bogie carries about $6\frac{1}{4}$ tons of sawnwood, compared with $3\frac{3}{4}$ tons in a railway wagon. It has a low frame, thus reducing lifting by the dockers. It is easier to move than a wagon and when empty occupies much less space, being only 8-ft. 7-in. long, compared with about 21-ft. for a wagon. The use of bogies for temporary storage also facilitates sorting according to the various Bills of Lading and allocations to individual importers.

The bulk of the sawnwood storage yards are on the site of the Citadel of the old Hull Garrison, and the area is still known as the Citadel Estate. Public streets were retained in this area, though the only residential buildings are the Dock Master's house and the Citadel public house. The strong prevailing winds blowing across this area have made it excellent for seasoning timber. Additional storage sites and standage accommodation for bogies have been provided by filling in the timber ponds at the south-east and eastern sides of the Dock, no longer required because of changes in the custom of the Trade, and by embodying the site of the famous Earle's Shipyard, which was closed in 1932 after being taken over by National Shipbuilding Securities, Ltd. Since the Shipyard was closed, no shipbuilding has taken place in Hull, though, as stated earlier, trawlers and other small vessels are built at outlying places on the Rivers Hull, Humber and Ouse.

A coaling appliance at Victoria Dock wrecked by enemy action is to be replaced, as it is expected that resumed coal exports will



Port of Hull—continued

include return cargoes for ships bringing timber from the Baltic, Scandinavia and Russia. The appliance will also be useful for bunkering, eliminating the cost and delay caused by transfer to another dock for bunkers. At the north side of the Dock there is a 40-ton crane, useful chiefly in connection with ship repair work.

Victoria Dock has two entrances, the main with a width of 60-ft. opening on the River Humber and the secondary with a width of 45-ft. opening on the River Hull. The Main Entrance is at present closed for extensive repairs, after nearly 100 years of use, but it is hoped that it will be re-opened in time for the Timber Season next year. Meantime, small vessels can enter and leave the Dock via the River Hull.

When the Alexandra Dock was built the Kingston-upon-Hull Corporation, anxious to ensure freedom of access to the river front, reserved a strip of land between Hedon Road, which runs along the north side of the Dock System at this point, and the River Humber. After Alexandra Dock had been built by the Hull and Barnsley Railway Co., the eastern half of the strip was handed over "on perpetual lease" to the Railway Company, for timber storage ground, and is still known as the Western Reservation area. The other has remained undeveloped, being used for gardens and as a rough playground, but recently has been leased to one of Hull's important timber firms for development in connection with their business as importers and sawmillers.

Alexandra and King George Docks are used principally for ocean-going ships, but the growth of the size of ships, even on near continental trades, together with the loss of berthing facilities due to war damage at the Western Docks, has resulted in a number of regular traders and tramps that would before the war have been accommodated at the Western Docks having to be found berths at Alexandra or King George Docks.

Alexandra Dock and the Extension have a total water area of 53½ acres. All the quays are well-equipped with cranes. The north side consists of a straight quay, at which there are two coal hoists, a third on a short jetty having been removed some years ago to make room for larger ships. In the centre there is a transit shed. The west end at present provides an open quay berth, a transit shed and cold store at this berth having been destroyed by enemy action.

The west end of the Dock is divided by a Jetty, with a transit shed, and the bays so formed afford excellent berths for overside working, ships being moored stern on to the west quay and secured at the bows by anchors. There were two single-storey transit sheds and warehouses at the west end of the Dock. One was completely destroyed, but the other one which was badly damaged has been re-built. At the south-west corner of the Dock are two single-storey transit sheds. The south-east corner is divided into sections by "A", "B" and "C" Jetties, each capable of taking a ship at each face.

The Extension Dock at the south side has a general open crane berth, at the east side a coal hoist and at the north-west side a single-storey transit shed with open crane berth and also another coal hoist. In the north-east corner of the Main Dock are two graving docks, 528-ft. by 56-ft. 6-in. and 580-ft. by 61-ft. 2-in. There are 2—10-ton derricks and 2—7-ton travelling cranes.

To the west of the Dock lie sawnwood storage yards, including the Western Reservation area previously mentioned, while at the eastern end there are large areas devoted to the storage of pitwood. The timber bogie system described above in connection with Victoria Dock is also operated in parts of the Alexandra Dock Estate. At the south side of Alexandra Dock and west of the Dock Entrance lies the River Pier, provided with two coaling conveyors, a transit shed and cranes.

The main entrance to the Dock is 85-ft. wide, with a depth of water at H.W.O.N.T. of 28-ft. on the outer sill, from which must be deducted 1-ft. 6-in. for the inner sill. In the case of large ships a further allowance must be made for the "invert" and about 26-ft. might be called a reasonable working figure. Three pairs of gates are provided; small vessels can be penned from 3/4 hours before high water to 3 after highwater, and larger vessels from 2 hours before high water to 2 hours after. The Extension Dock has no gates and the entrance is 70-ft. wide.

West of the Extension Dock there are standage sidings and pit-prop storage yards, but the insistence of the Corporation on maintenance of access to the Humber foreshore resulted in "Corporation Road", from Hedon Road to the Humber foreshore, separating the Alexandra and King George Dock estates.

Although Alexandra Dock was opened so long ago as 1885, the layout, with its combination of straight quays and jetties, is considered by many to be better than the "H" type of design adopted for King George Dock, which was opened in 1914, and has not yet been completed.

King George Dock, with a water area of 53 acres was designed in the shape of the letter " H " with sides parallel with the Humber, but so far only the north-west and north-east Arms have been constructed. Space for the south-west Arm was left when the ground was made up by reclamation from the Humber foreshore. The site of the south-east Arm is used for pitwood storage.

The north-west Arm provides six berths, well equipped with cranes, 3 lines of railway track and a roadway, all between the quay face and the transit sheds, of which there are three at each side of the Arm. Those on the north side are single-storied and have floors ramped up to form a loading bench for railway wagons and road vehicles at the north side of the sheds. Those at the south side of the Arm are doubled-storied, the quay level being continued through the sheds to the railway lines and road surface behind. The upper storeys are used as Warehouses or supplementary transit sheds.

At the west end of the Arm is a Grain Silo with a capacity of 40,000 tons in 288 bins. One berth at the north side of the Arm and two at the south are fitted for bulk grain discharge. Two of the 10-ton cargo cranes on the quay at each of the sheds are equipped at the back with telescopic bucket grain elevators. When the appliances are used for this purpose the jibs are swung inshore and the elevator legs are sunk into the grain in the holds of the ship. The grain elevated is discharged through chutes and holes in the quay on to underground belts carrying the grain to the distribution chamber underneath the quay at the west end of the Arm. Thence the grain is elevated, automatically weighed in 2-ton draughts and after re-elevation distributed from the top floors of the Silo to the bins. Delivery can be arranged in bulk to water and rail, or in bags to water, rail or road. The shore grain-discharging machinery is supplemented by portable elevators, supported on the ship's hatch coamings and discharging either to the belts ashore or overside to lighter. For overside discharge, two floating Avery automatic 1-ton weighing machines are available. By the use of a combination of crane elevators and portable elevators discharging to Silo belts and overside a normal speed of about 2,000 tons per ship per working day of 8 hours is achieved in the case of cargoes not having stowage complications.

The roofs of the three sheds and three warehouses are flat and are equipped with travelling cranes which can transfer goods across the roofs or lift or lower through hatchways. The roof cranes span the railways and road in rear of the transit sheds.

On the north side of the Dock coaling berths are arranged in sawtooth fashion, and the present coaling equipment comprises two coaling belts and a twin coal hoist. The appliances are rated at 600 to 800 tons per hour. The coaling berths, including those not yet provided with coaling appliances, are useful for vessels wishing to discharge overside. At the east end of the Dock are the two dry docks 466-ft. by 66-ft. and 568-ft. by 72-ft. resectively, with a 25-ton electric crane on the mid-feather, and each dock has a 10-ton derrick crane also.

At the south side of the North-east Arm is an open quay well equipped with cranes, and the quay at the east side of the dock entrance includes among its crane equipment 4—7-ton cranes capable of working grabs.

The dock entrance, 85-ft. wide, is divided into two locks of 500-ft. and 250-ft. respectively. The depth of water on the inner sill at H.W.O.N.T. is 33-ft. 3½-in. from which should be deducted 1-ft. 4-in. for the invert. Penning can be operated as at Alexandra Dock.

Large areas of land within the Dock Estate are available for timber storage.

Port of Hull—*continued*

Aerial view of Hull Docks.

East of King George Dock lies the Salt End Estate, part of which is occupied by the Oil Installations (Shell Mex and B.P. Ltd., and Anglo-American Oil Co.) and the works of British Industrial Solvents, Ltd., Hull Distillery Co., Ltd.. Carbon Dioxide Co., Ltd., the Methylating Co., Ltd., and British Vinegars, Ltd. Ample space remains for industrial development. The two Salt End Jetties provide a minimum depth of 30-ft. at L.W.O.S.T. for the handling of bulk oils, spirit and molasses.

The River Humber is very muddy and the Dock Engineer's Department are constantly dredging at the Salt End Jetties, within the Docks and at the docks entrances, but outside these areas no dredging is done. The River Authority is the Humber Conservancy Board, a separate statutory body founded in 1852, and embodying representatives of the various Interests, including Shipping, Chambers of Commerce, Ministry of Transport, Railways, Canals, Municipalities and the Hull Trinity House. They control the pilotage, which is compulsory, and the marking and lighting of the channels, the buoys, light floats and light ships being moved by the Conservancy's Engineer as necessary.

Administration

In considering the administration of the Port, it is necessary to remember that in Hull by statutory right the owners of goods may undertake their own labourage operations on the Docks, but the Port Authority (the Railway Executive) is willing to undertake the labourage of most kinds or articles, subject, of course, to the arrangement of suitable terms. The Port Authority acts as an independent stevedore on request, but does not license other persons performing dock work. The Port Authority employs Registered Dock Workers as necessary for any work falling within the definition of "Dock Work". It employs water staff such as dock masters, berthing men, dock operating staff such as cranemen, capstanmen, checkers, loaders, porters, etc., dock commercial staff such as clerks, rail operating staff such as shunters and loco men and engineering staff in the civil, electrical and mechanical branches.

In addition to the dockers and persons employed by the Railway Executive, there are many thousands working on the Docks such as trimmers, ship repairers, painters, scalers, tug men, water men, boatmen, fish trade workers, Customs Officers, ship's agents, canteen staff, and so on, the estimated total of all grades of employees being over 10,000.

The Railway Executive as successors to the L.N.E.R. are the Port Authority except for the Old Harbour, but it has been announced that in due course the Docks and Inland Waterways Executive will take over from the Railway Executive.

The management of the Port is under the immediate supervision of the Railway District Goods Manager, and District Superintendent, for Commercial and Operating Department functions respectively. The commercial work includes responsibility for public contact and general policy, including berthing of ships and rates and charges, while the Operating Department are responsible for carrying out the work of the Railway Executive at the Docks.

For administration the Docks are formed into three groups, over each of which a Dock Superintendent has charge with responsibility to the District Goods Manager and the District Superintendent jointly. Salt End Jetty, King George and Alexandra Docks form the Eastern Group; Victoria, Humber, Railway, Prince's, Albert and Wm. Wright Docks form the Western Group; and a third Dock Superintendent has responsibility for St. Andrew's

Port of Hull—*continued*

Riverside Quay, Hull: Damage caused by air-raids in 1941.
(Above): View from Quay towards Fruit-Sheds.

Dock and Extension. The Dock Superintendents, in addition to looking after the dock working itself, have Operating functions in respect of dock railway working equivalent to those of Railway Yardmasters. The Dock Masters work under the supervision of the Dock Superintendents. The Port Authority administer the Port Labour Advisory Committee, and in all matters affecting the operation of the Port work in close co-operation with the Chamber of Commerce and its Sections, the Joint Port Working Committee, the National Dock Labour Board and any other Authorities or Interests concerned.

Traffic

Before the Second World War, about 5/6000 ships of 6½ million N.R.T. and 4,000 trawlers of about 680,000 N.R.T. visited Hull annually. In 1947 there were 4,812 ships with a N.R.T. of 5 1/3 million and 2,795 trawlers with an N.R.T. of 326,000.

Imports in 1938 totalled over 6 million tons of merchandise and 292,000 tons of fish. In 1947 the total was just under 4 million tons and 238,000 tons of fish. For the first six months of 1948 the figures were 2,172,090 tons and 135,418 tons. The principal imports and the tonnages during 1947 and the first half of 1948 are set out below:

	1947 Tons	6 months ended 30th June, 1948. Tons
Mineral Oil	1,233,714	697,276
Timber	357,039	102,228
Grain	510,026	348,164
Oilseeds	255,277	165,462
Molasses	130,088	56,103
Fruit and Vegetables ...	144,822	103,716
Iron and Steel	143,379	133,366
Sugar	69,565	35,304
Paper and Pulp ...	81,075	36,471
Wool	43,938	42,237
Provisions	113,921	50,118

The exports of general merchandise amounted to 739,000 tons in 1938 but only 508,946 tons in 1947 and 276,113 tons in the first half of 1948.

The tonnages of the principal items are shewn below:

	1947 Tons	6 months ended 30th June, 1948. Tons
Machinery	10,294	7,856
Iron and Steel ...	91,925	48,288
Grain	54,284	40,577
Flour	3,062	232
Meal and Cake ...	44,924	23,656
Fertilizers	23,691	7,416
Textiles	3,145	428
Oils, Paints, etc. ...	15,417	6,837
Wool	19,546	12,956
Brass and Copper ...	25,483	13,486

Hull has inland waterway connections with a very large area of the country, and it is estimated that normally as much as half the imports and exports of general merchandise are discharged or loaded "overside". By ancient statutory right, lighters and river-craft have free access to the docks.

Coal shipments reached over 6 million tons in 1913, but in 1938 the figure was little more than 2 million tons. In 1947 the total was only just over 1 million, but in accordance with Government policy exports are being resumed and for the first six months of 1948 shipments totalled 957,893 tons.

War Damage and Restoration Plans.

Although the City and its inhabitants suffered severely at the hands of the enemy, the damage at the Docks did not interfere seriously with wartime operation; but it has left a legacy which will be a handicap in the restoration and increase of the trade of the Port. Sixty per cent. of the transit shed and warehouse accommodation at the Docks was destroyed; Railway Dock was rendered useless for general dock operations, and the splendid Riverside Quay, a most valuable facility for handling fruit and vegetables and provisions, was completely destroyed. Plans for reconstruction and development include the following:—

Modernisation of **King George Dock** by the provision of the South West Arm equipped with three good transit shed berths, each capable of accommdating a 500-ft. ship, and at the South Side an additional open quay berth well equipped with cranes.

Adidtional quay cranes.

Alexandra Dock: Improvement of River Pier by westward extension of 150-ft. to facilitate mooring of ships at coal conveyors and to make more room for general cargo working east of the conveyors.

An additional transit shed.

Restoration of No. 33 Shed and Warehouse.

Restoration of No. 21 Shed and Warehouse.

Modernisation and supplementation of quay crane equipment.

Improvement of No. 4 Coal Hoist in Extension Dock.

Victoria Dock: Restoration of damaged sheds and warehouses. Replacement of damaged coaling appliance by new modern plant.

Humber Dock: Restoration and enclosure of dock transit sheds.

Albert Dock: Reconstruction of Riverside Quay, the river face being advanced from the old line about 50-ft., thus giving greater freedom of movement ashore and greater depth of water at the berths. The Quay to be equipped with modern cranes and transit sheds. Improved rail and road access to be provided, including a new road westward along the river front, joining the Riverside Quay and the South Side of Albert Dock to St. Andrew's Dock Subway.

(Below): View from Quay towards Clock-Tower.

Port of Hull—continued

South Side of Albert Dock: Provision of transit sheds and warehouses equipped with modern cranes. North Side of Albert Dock: Provision of transit sheds in place of destroyed warehouses and transit sheds.
Enclosure of open transit sheds.
Wm. Wright Dock: South Side: Modernisation of Wades Cranes berth at west end.
North Side: Enclosure of open transit sheds.
St. Andrew's Dock: Enlarged and modernised Slipways.
Widening of water space in Main Dock.
Processing halls for filleting and packing, etc.
Modernising landing markets.

The ban on capital expenditure has slowed down the reconstruction work, and the major projects are awaiting authority for the work to proceed, but one of the two new transit sheds on the North Side of Albert Dock is nearing completion and the second will be started when the first is finished. No. 33 Shed and Warehouse at Alexandra Dock is nearly complete except for the roof, and various sections of the quays, railways and roadways have been relaid and bought up to date. Other minor but nevertheless important work is being undertaken as conditions permit. Hull is determined to maintain its position as the major East Coast port outside London.

Congestion at Port Elizabeth

Special Measures taken to Ease Conditions

Congested conditions at Port Elizabeth Harbour, experienced during recent months, have been causing concern to the South African Railway Administration, and the special measures that have been taken to relieve the position are described in the August issue of "South African Railway News." These special measures are intended to relieve the position immediately and are not a part of the long-range programme of improvements at Port Elizabeth Harbour.

The crux of the problem is the unexpected concentration at Port Elizabeth of a large number of ships with cargoes beyond the capacity of existing handling facilities. The congestion arises from abnormal conditions, which were experienced to some degree in August and September last year, but which became aggravated as from April this year by an even heavier concentration of incoming traffic, including motor-vehicles. Railway and harbour resources are as a result being over-taxed and ships have had to be delayed.

Increase in Traffic.

To give some idea of the enormous increase in traffic that has taken place at Port Elizabeth, the following particulars of ships and cargoes dealt with at that port for the financial years 1946-1948 and during the months of April, May and June, 1948, are quoted:—

Year Ended	No. of Ships	N.R. Tons	Cargo Landed
March, 1946	559	1,095,705	421,802
March, 1947	877	2,472,667	1,063,355
March, 1948	1,003	3,638,647	1,117,936
Month of			
April, 1948	84	316,292	137,720
May, 1948	85	317,981	123,208
June, 1948	87	336,614	143,648
Total for the Quarter	256	970,887	404,576

From these figures it will be observed that during the three months April to June, 1948, almost as much traffic was handled through the port as during the financial year which ended on the 31st March, 1946.

The heavy demand on the transport resources of the Administration is further illustrated by the following particulars of the gross tonnages conveyed by rail from the principal Union ports during the first six months of the years 1947 and 1948:—

	1947	1948	Increase or Decrease
Cape Town ...	1,418,085	1,376,667	− 41,418
Durban ...	2,316,379	2,384,203	+ 67,824
Port Elizabeth	1,227,871	1,556,785	+ 328,914
East London ...	631,162	727,883	+ 96,721
	5,593,497	6,045,538	+ 452,041

It will be noted that traffic from Port Elizabeth reflected the greatest increase. Traffic cleared to the north from the port amounted to 278,179 tons during June, 1948, as compared with 203,073 tons during June, 1947, and 193,778 during June, 1946.

Apart, however, from the increased traffic handled through Union harbours there has been a huge increase in railway traffic throughout the country, the total volume transported by the railways having increased from 35,881,880 tons in 1939 to 52,614,456 tons in 1947.

All these factors are presenting a traffic problem to overcome with the engine power and truckage available, but every effort is being made to speed up the delivery of new trucks and engines; to improve dock and shed-handling facilities and to operate faster and more frequent trains. Under present conditions, with transport demands at peak levels throughout the country, it is not always possible to supply all the necessary truckage to a particular area on a given day. Mal-distribution of truckage will follow undue preferential treatment to imports, coal, or any other commodity, and this will result in further confusion. The Railway Administration is trying to use its resources as equitably as possible in the interests of all railway-users, a fact that has to be taken into account.

Proposed Improvements.

Special steps taken or to be taken to relieve conditions at Port Elizabeth include:

(1) **Provision of additional wharves and berths.** It is proposed to make provision for two berths and two cargo sheds for ocean-going vessels on the South side of No. 2 quay, also for berths and cargo sheds for coasters.

(2) **Cranes.** Four mobile cranes are to be acquired as soon as possible and the port is to be equipped with a further crane of 15 tons capacity.

(3) **Stacking areas.** Certain areas for stacking and loading rough goods are being enlarged.

(4) **Acceleration of checking work.** Office accommodation is being provided in the cargo sheds to accommodate checking staff in order accelerate the work relating to the checking and delivering of cargo.

(5) **Crane drivers.** Additional crane drivers are being appointed.

(6) **Intensified goods delivery service.** With a view to expediting the delivery of goods, arrangements have been made to deliver consignments to certain firms during week-ends, whilst goods which have to be delivered to loading yards are now largely being conveyed at night with motor lorries instead of in trucks in order to release trucks more quickly.

(7) **Cartage service.** The departmental cartage plant is being augmented by an additional 15 Karrier Bantam Tractors which will permit of a re-allocation of cartage plant to better advantage, and this will expedite the delivery traffic by road locally within the Port Elizabeth cartage area.

(8) **Truckage and engine power.** It has also been decided to assemble 1,000 trucks, which are expected from Canada shortly, in Port Elizabeth, and this will also afford a measure of relief because the trucks will be able to clear traffic from Port Elizabeth immediately they are completed.

(9) **Train services.** A more intensive good train service between Port Elizabeth and inland centres is to be introduced which will step up the tonnage of goods traffic that can be conveyed northwards. This is no small undertaking as it entails converting sidings into stations and the erection of dwellings at certain centres to accommodate additional staff.

From these measures it will be seen that the Administration is fully alive to the position and that it is taking all steps practicable to meet the situation.

Dredging at the Port of Lagos

Description of New Suction Hopper Dredger

As announced in a previous issue of this Journal, the Suction Hopper Dredger, "Oyo," has been built by Messrs. Wm. Simons & Co., Ltd., Renfrew, Scotland, for service at the Port of Lagos.

The vessel was built to the order of the Crown Agents for the Colonies, acting for and on behalf of the Government of Nigeria, and was constructed under the supervision of Messrs. Coode, Vaughan-Lee, Frank & Gwyther, Consulting Engineers, London.

After completing her trials in the Firth of Clyde, the vessel sailed from Renfrew on 11th July, 1948, and arrived at Lagos on the 4th August. Prior to the commencement of a Guarantee Period of 100 working days the vessel successfully underwent a short trial to demonstrate that neither the Dredger or the Dredging Equipments had suffered during the passage and were in good working order. The following is a brief technical description:

The vessel is a sea-going steam self-propelled Twin Screw Stern Well Suction Hopper Dredger capable of undertaking three distinct forms of dredging and of discharging spoil into, or from, her own hopper or overboard into barges and also of discharging spoil through a shore pipeline to a distance of 600-ft. at an elevation of 10-ft. above water level.

Nature of Dredging Service

The three services are as follows:—

(a) Dredging free-running sand from Lagos Bar to a depth of 42-ft. below light flotation level, under open sea conditions, and discharging into her own hopper and transporting the spoil dradged to the dumping ground.

(b) Dredging harder and more resistent material from the internal channels of Lagos Harbour to a depth of 40-ft. below light flotation level under calm water conditions. The vessel is also to be capable of cutting her own flotation.

(c) The remaining service is dredging non-free running sand and other compacted material from exposed bars to the seaward of river mouths under exceptionally severe conditions.

Principal Dimensions

Hopper Capacity	4,000 tons
Dredging Depth:—	
"A" Equipment for Lagos Bar—plain suction	42-ft. 0-in.
"B" Equipment for Lagos Harbour Service—cutter gear	40-ft. 0-in.
"C" Equipment for Bonny Bar Service—drag	40-ft. 0-in.
Dredging Pumps and Pipe Systems	33-in. bore
Maximum draft in salt water, fully laden ...	20-ft. 0-in.
Speed of the vessel	10 knots
Length between perpendiculars	340-ft. 0-in.
Breadth moulded	53-ft. 0-in.
Depth moulded	26-ft. 0-in.

Dredging Equipment

The Dredging Equipment aboard the vessel consists of two, 33-in. centrifugal dredging pumps, either of which may be coupled to a triple expansion steam engine, the whole system so arranged that either pump may draw from the various outboard dredging equipments, or alternatively, from the hopper and discharge to the hopper, or alternatively, overboard into barges or into the pipeline.

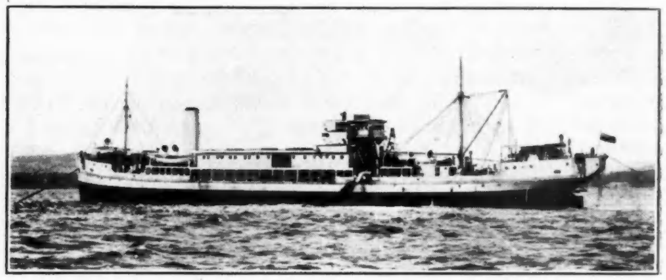
The three separate distinct forms of outboard dredging equipment "A", "B" and "C" may be described as follows:—

"A" for Lagos Bar Service, dredging free-running sand—a plain suction nozzle universally jointed to the lower end of the suction pipe, the pipe being carried stress free in a structural steel frame accommodated in a central stern well and hinged to the vessel above the load line. In this service the dredger will normally operate with both bower anchors down and a long stern line out, controlled by a special winch, the discharge being to the hopper only. The universal joint at the lower end of the pipe is of the ball and socket type.

"B" for Lagos Harbour Service, dredging clay, laterite and other materials—a suction frame is fitted with a powerful rotary cutter gear and hinged on the same pivot as for Equipment "A". In this service the vessel will operate on wire rope and anchor moorings, all controlled by special winches and will either discharge to reclamation barges brought alongside or into its own hopper.

"C" for bar service, dredging non-free-running sand, mud and other compacted materials. The drag suction equipment will be used, hinged on the same pivot as for Equipment "A". In this service the vessel will operate while steaming under her own power at a slow speed.

Facilities are available at Lagos for shipping and unshipping the equipments. All equipments are interchangeable on the same pivot and use the same hoist gear, which latter is of the hydraulic type.



Suction Hopper Dredger, "Oyo."

Reception, Dilution and Disposal of Spoil

The large overflow trunk is arranged in the hopper at the aft end on each side and led across the deck. The discharge from the dredging pumps is led into a single pipe fitted centrally fore and aft over the hopper above the maximum water level and having controllable twin discharge doors on the bottom of the pipe for directing the spoil into the various hopper compartments.

The hopper is arranged to discharge through two rows of circular ports in the bottom of the vessel, closed by valves on the Lyster system. Each valve is operated by an independent hydraulic ram controlled from the Accommodation Deck. In addition, the hopper is provided with two lines of suction piping placed on the outer side of each row of Lyster valves and led to the dredging pumps. Each hopper suction pipe has a sea injection at the forward end and a suction opening in the hopper controlled from the Accommodation Deck opposite to each Lyster valve.

A very powerful and comprehensive diluting and flushing system is arranged for each hopper compartment and served by an independent centrifugal pump placed in the engine room. The overboard discharge is led to each side of the vessel and continued by a ball and socket joint so arranged that the overboard discharge pipe may be lowered overside and discharged directly into suitable barges moored alongside the dredger.

Form and Arrangement of Vessel

The form of the vessel is arranged entirely for accommodating the requisite dredging equipment, propelling machinery and personnel, while affording particularly good seagoing and steaming qualities in the circumstances obtaining during the employment of the special dredging equipments.

The hull is arranged with a raked stem to give ample room on the forecastle head for the dredging winches and a large poop is provided aft for the same purpose.

The vessel is provided with twin rudders operated by steam steering gear which is situated in the engine room and controlled from the navigating and operating bridge. An upper bridge and a lower bridge is also provided over the aft end of the Accommodation Deck. The whole of the operating gear and controlling of the various functions of the dredger is concentrated in the operating bridge.

Marine Salvage

Operation by a Port Authority

Marine salvage operations are not usually included within the scope of the various undertakings of a dock authority, and indeed, there are only two ports in the U.K. which assume this responsibility for the removal of all wrecks which may occur, and are likely to become obstructions to shipping in the waters within the jurisdiction of that port. The policy which originally determined the institution of such a complementary service would obviously be based upon several important questions, i.e., the potential resources of the port for the establishment, and maintenance of the service; the geographical situation of the port; its salient features, with respect to approach channels, etc. The location of the nearest salvage service, as a means of providing alternative salvage services; constitution of the port's existing marine staff, to allow of augmentation to provide the additional service; the port's responsibilities and commitments with regard to buoyage, lighting, surveying, etc., to admit economic combination of all services; data in connection with casualties which have occurred, as sufficient to justify establishment of a salvage service; legislative sanction for such operative powers; the possession of suitable local sites for completion of salvage operations, i.e., beaching and repairing; mutual agreement with owners of vessels using the port.

All these, and many other complementary problems, including the establishment of the necessary skilled staff, and personnel, and all the costly and complex plant for this undertaking, must be taken into consideration. It must be noted that port salvage is not in itself directly remunerative, to the operating authority. It must rather be regarded as providing a valuable amenity to a modern first class port by proving the means of saving property of users of the port, and by acting as a safeguard to the port itself; in being able to effect a rapid and safe means of removal of obstructions within the waterways and docks of the port. The advantages of the port owned and operated service, over that of an outside and independent firm or company, will be obvious. In the first case, the service is not operated for profit, and will therefore prove less costly to the owners of salved property. The service and operations will be conducted by a senior employee of the port authority, who is an expert on all local conditions, etc., which will materially conduce to success in salvage operations. This official, too, is also fully cognisant of the serious situations which might result from the acceptance of undue risks in the operations. Risk must always exist in salvage work, and be regarded as one of the responsibilities, but must, whenever possible, be reduced to the extent of what may be considered as reasonable, as compared with possible resulting consequences.

The Port Salvage Service is in a situation to render immediate services, and as "speed" is so often the very essence of salvage service, this may well result in "saves," instead of losses. Increased and more satisfactory co-ordination between all the port officials may be required to indirectly assist in operations.

The principal argument against the port service, is, of course, the question of expenditure, on account of both, the capital cost of equipment, etc., and the maintenance thereafter. The latter item of expenditure, can be materially reduced by certain ports which administer their own lighting and buoyage, etc., services, and from which services, expansion can take place to assist in maintaining the additional service.

The administrative head, the staff, and at least a nucleus of the personnel of a salvage service must be thoroughly experienced in salvage work. Marine salvage is the work of a specialist, and demands a combination of the qualifications of seaman, engineer, naval architect, and ship repairer—or as much of each as possible! It can only be learnt in the hard school of long and actual experience and not by text books. The successful salvage official must primarily be able to assess risk; be capable of making rapid decisions; be possessed of a flexible mentality; and capable of accepting reverses with equanimity. Salvage is a hard but fascinating subject. In no other "walk of life" is there to be expected to be encountered so many setbacks and disappointments, from circumstances beyond control. It must also be admitted however that the satisfaction experienced from successes achieved, far outweighs all the adverse emotions, resulting from failures. Experience by itself is insufficient and misleading, on occasions. The salvor requires the ability to "adapt" experience to meet possibly new and changed conditions in any particular "job." It can be said that, after a lifetime of salvage work "no two jobs are exactly the same" and each successive one contains some new element, which calls for some new or differentiation from old methods. Whatever the extent of the salvor's experience, he continues to "learn."

It is remarkable how the subject of salvage attracts a legion of "Inventors"! These persons approach the salvor with their new ideas, in a spirit of supreme confidence, extensive reticence, or veiled truculence, and with a thorough convinction that their views are both revolutionary and sound. Their departure from an interview, upon (usually!) rejection of their ideas, is conducted with accusations of conservatism, or professional jealousy. Needless to remark—the vast majority of these proposals are fantastic, and lacking in the most elementary knowledge of mechanics, etc., and vary in degree from the sublimely ridiculous, to a "rehash" of well-established practices. The brainy and and quick result visitor offered to raise the "Lusitania" (20 years after sinking!) in two days. When pressed for his plan, he, at last, reluctantly confided that this would be effected by the attachment of thousands of balloons to the portholes of that vessel. Another bright idea was to fill a sunken vessel with a sufficient (!) number of ping-pong balls to ensure flotation. Unfortunately, experience teaches that apart from the use of new "aids" which modern science provides, there is no rapid and easy road to success, which depends rather upon careful calculation and long and arduous work.

Let it be assumed that a port has decided to establish its own salvage department and as an augmentation of an existing department for buoyage, lighting, surveying and other duties. It will be necessary to cater for all the various types of casualties which may happen, and for which, special equipment and plant must be provided. These casualties may briefly be divided into the following categories:—

(i) Vessels damaged by collision, stranding, fire, etc., which require immediate assistance to prevent sinking. The assistance necessary is usually that of pumping and effecting a temporary patch over the damage, as far as possible.

(ii) Vessels beached after incurring serious damage and requiring salvage assistance to refloat. The services required follow the lines of (i) but to a greater and more prolonged extent.

(iii) Vessels sunk, and requiring removal, necessitating very extensive salvage services, and involving the raising of the wreck by the most convenient means, i.e., by direct lifting by other vessels; by pumping; by compressed air; by a combination of any or all of these methods.

Category iii can again be sub-divided, and distinction made between vessels sunk in a tidal navigable waterway and causing serious obstruction to traffic, and those sunk in docks, and not forming a problem for instant removal. Variations and combinations of the above forms of casualty are too many to enumerate, but every conceivable form must be taken into consideration, and potential provision made for same. A recurring cause of casualty is the result of a ship fire in dock, where the reckless filling of the vessel with water, regardless of all laws of stability, causes her to capsize, and become a serious casualty, which might easily have been avoided under the skilled supervision of a port official to control the fire-fighting activities engaged. One such case occurred in a port, where a 20,000-ton vessel became seriously on fire, and was obviously about to capsize on account of the continuous flow of loose water into her. All further fire-fighting action was stopped by the port official, and the vessel ultimately burnt out, was scuttled and remained upright in dock. She would, in any case, have become a constructive total loss from either fire or submergence, but her removal cost only **£25,000** instead of **£150,000**, which would have been incurred by the major operations, as resulting from capsizing. A port authority which includes marine salvage—as operative within its own area, requires very considerable and costly plant and equipment, in addition to the

Marine Salvage—continued

administrative and executive staff. The prime essential is a salvage vessel, suitably designed and equipped for the particular conditions under which she will operate, and competent to deal with all types of casualties, which are likely to occur. The cost of such a vessel will be not less than £200,000.

For the lifting of vessels, special craft must be acquired. These are called "Camels" and are of about 500 tons lifting capacity. Lifting craft exist with 1,200 tons lifting capacity, but are generally less suitable for port work.

Submersible pontoons of about 70 tons capacity are also useful to provide auxiliary power, and for minor operations. A large stock of lifting wires of special flexible steel, and ranging in size (circumference) from 4½-in. to 9-in., and with breaking strains of from 65 tons to 300 tons respectively, must be maintained.

Pumps:—The diesel engine has now largely superseded the petrol driven pump, and a large number of these pumps of varying sizes, from 2-in. (diam.) to 12-in., must be kept in readiness for use. The pumping capacities of these range from 70 to 900 tons per hour.

Steam driven pumps also retain their utility, especially on protracted operations, where it becomes necessary to submerge pumps during intervals.

These pumps must all be accompanied by an adequate stock of hose, both steel and flexible, and all the necessary couplings, elbow joints, etc.

Other major items are: Portable boilers, for the provision of steam power when unobtainable by other means; lighting sets, and these should include light portable sets for emergency use; air compressors; diving equipment. A complete list of salvage requirements, from collision mats to oakum, would occupy several pages, and is unnecessary here. The total value of all salvage plant and equipment as necessary for a port service is in the region of £500,000. This appears—and is—a very formidable sum, and it may appear doubtful whether such outlay is justifiable. It must, however, be noted that such expenditure is incurred in both the interests of the port itself and in the large numbers and tonnage of vessels using the port, which in some cases may amount to an annual total of 12,000 vessels and of 15,000,000 tons. Certain technical terms are used in this article, of which interpretation may be necessary.

"Parbuckling."—This is the particular form in which power is employed for the uprighting of a vessel from an inclined position. It is also applied for lifting purposes and in each case operates in a rolling motion. A common example is that of a beer barrel being rolled up a slope in the bight of a rope. In uprighting a vessel, the parbuckling wires are attached to the upper side of the vessel, passed around and beneath the vessel, and attached to the instrument or power for uprighting the vessel.

Parbuckling is also effected in some cases, and notably in those of large and heavy vessels, where additional power is required, or in positions where the ordinary method is inapplicable by restriction of space, by the erection of tripods upon the exposed portion of a vessel. These are usually of steel, of sufficient number, suitably spaced and capable of bearing the estimated strain to be imposed upon each. By this means, a greater amount of leverage is obtained. The parbuckling wires are led through these tripods and from thence to shore winches by means of heavy purchases.

In a recent and most notable salvage operation which occurred in a large port, the uprighting of a large vessel, capsized in dock, was mainly effected by 14 tripods erected upon her side, with the application of 100 tons strain upon each. This constituted one of the biggest salvage feats ever attempted.

"Lifting" a Vessel.—This can be done (up to a limit) by three distinct methods or by a combination of such. They are: by pumping; by the introduction of compressed air into the vessel and ejection of water from her, thereby: by wires. By the latter method, the wires are passed beneath the vessel, and as suitably spaced as circumstances permit, with regard to the distribution of weights in the vessel. On occasions, the correct placing in position of a single wire may occupy several days of hard work. When in position, these wires are attached to the lifting craft and the vessel is "lifted" by tidal rise or by other means, such as by lowering and raising the dock level, etc.

"Pinning."—The lifting craft are said to be "pinned" when all lifting wires have been hove taut and attached to them, and while they are then awaiting a rise of water level.

Marine salvage assumes many diversified forms and brief accounts of the actual operations of several instances, are here given.

A large vessel received mine damage about 25 miles outside the port, had been abandoned, and was slowly sinking. The salvage party of the port proceeded to her at once and placed pumps in the after hold, to which the damage was apparently confined, the anchor and cable slipped, and accompanying tugs took her in tow towards shoal water, where beaching could take place, to allow further operations before making it safe for her to navigate the channels of the port. By the time that the pumps had gained temporary control of the water, the after part of the vessel had sunk so low in the water that the name of the vessel had disappeared. She was brought to an anchor in a position in which there would be 20-ft. of water at low water. That night, barges and dockers arrived, and discharge of cargo commenced. Considerable trepidation was felt in starting these operations, as the area was known to be heavily mined with both magnetic and acoustic mines, and the constant movement of craft around the vessel was not conducive to safety. Steps were also taken to locate and seal the damage, which was found to be situated in a boiler room and leaking into the after hold. After 48 hours' intensive work, the vessel was refloated and towed into port. It was rather remarkable that shortly after removal from the position of beaching, several mines were observed to detonate in approximately the position formerly occupied by the vessel. It was afterwards estimated that a delay of a further half-hour in rendering salvage service would have resulted in the loss of this valuable vessel. The above instance may be cited as inclusive within Category I.

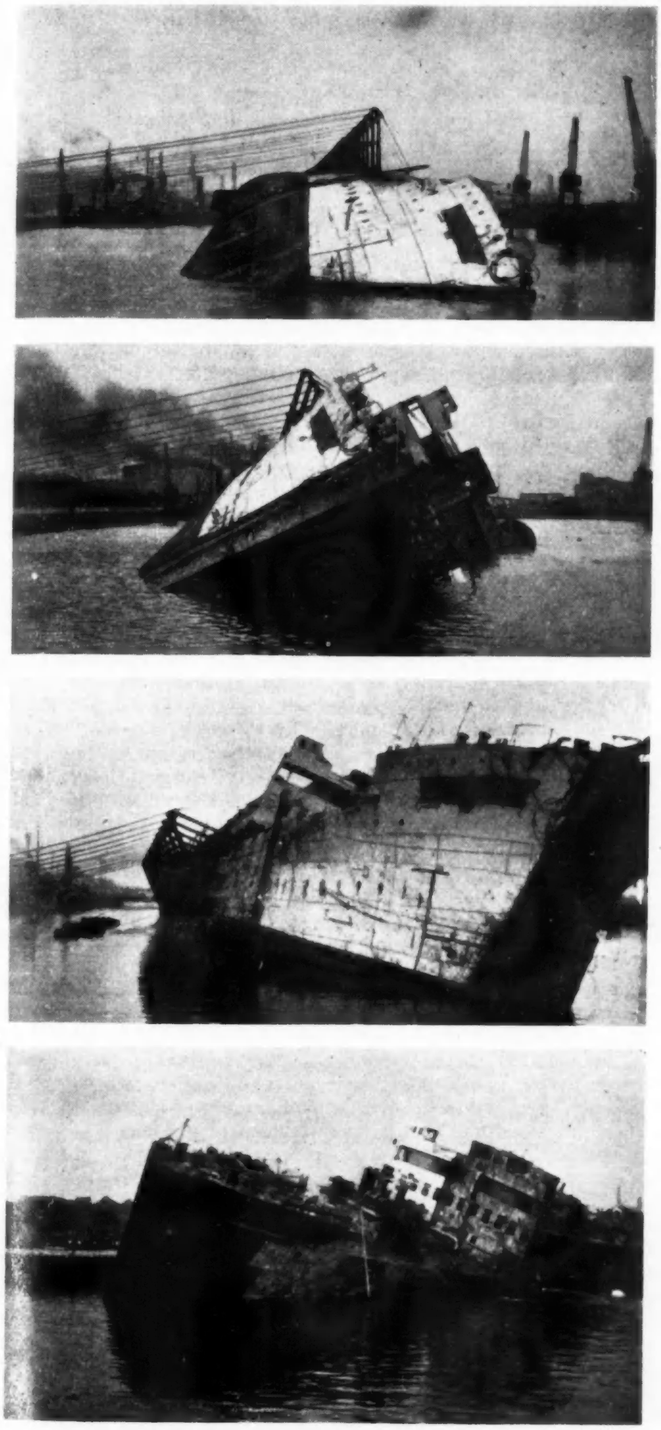
The following are illustrative of Category II.:—

A new and fully laden vessel stranded on a sandbank in a river, and "broke" on the following low water. The "break" was complete across the deck and both sides, to below the turn of the bilge. It was decided that it would be too hazardous to attempt to refloat and dock the vessel as one complete entity, but instead, to complete the severance and refloat in two halves. This entailed the cutting of floors, frames and bottom plating, etc., in the wake of the coal bunker, where the break had occurred, and for this purpose use was made of oxy-acetylene burning plant and small charges of explosive. In the meanwhile, discharge of cargo took place concurrently, and, as a large portion of cargo consisted of steel, in the form of bars, ingots, etc., an electro magnet of 5 tons lifting capacity was successfully employed, particularly for the under-water periods. After considerable difficulty experienced in the cutting, owing to sinkage of the vessel into sand and mud, she was finally severed and the two portions, after being patched and shored up, were towed to graving dock, where "re-union" and repairs were effected, and the vessel eventually resumed service.

Another and entirely different case, but within the same category, was that of a large tanker with a full cargo of spirit, which stranded on a bank in the river and a short distance outside the river wall of a dock entrance. She severely fractured herself on the falling tide, and a large quantity of spirit—estimated at 2,000 tons—escaped into the river and covered the immediate area to a depth of several inches. At it was the depth of a particularly cold winter, a comparatively small amount of evaporation took place, and the situation generally, and particularly in the vicinity of the various dock entrances, etc., where concentration of spirit took place, became extremely dangerous. The smell of the spirit extended several miles from the scene of the casualty, on both sides of the river. All necessary precautions, as far as practicable, were taken, and a small salvage party boarded the vessel to connect moorings to the river wall. During this operation the strictest precautions were observed to avoid "sparking" from boots on the steel deck

Marine Salvage—*continued*

and in the handling of steel wires. Of the original boarding party of 15, no less than 12 were taken to hospital after completion of the operation for poisoning by fumes. The problem arose as to



Uprighting a Vessel by Parbuckling Wires and Tripods.
1. Wires hove taut—commencing to heave.
2. Vessel rising.
3. Vessel at final position—19 deg.
4. Vessel uprighted sufficient for final operations of pumping, etc.

the means of discharging the remaining cargo. It was quite unsafe for any other vessel to approach, and a means of operating the vessel's own pump room and connections, which were still in working order, had to be found; and also storage facilities ashore for the spirit. Operations for these were initiated by the suspension of steam hose and compressed air pipes upon taut wires from ship to shore. Steam was supplied by shore boilers, but as the result of the severe cold weather condensation in the hose became considerable and much difficulty was encountered. The cargo so discharged was carried by a complex system of piping to an empty tanker in the dock. After an amount of lightening had taken place by this method, the vessel was moved close to the river wall and an empty tanker placed in the dock, and, by a combination of "pull and push" pumping between the two vessels, complete discharge was finally effected. During these operations, although too dangerous for the installation of an intership-shore telephone, one individual (shore gang) was actually discovered about to smoke on board, and, on discovery, was chased overboard by his infuriated companions. The damaged vessel was then docked "by hand," and after gas-freeing operations, which were extensive and dangerous, as they entailed the transfer of the residue of the spirit into an empty graving dock and thence into the river, she was towed away after temporary repairs had been made for seaworthiness.

As an illustration of an instance as within Category III., a notable case was that of the world's largest floating crane, which was sunk by enemy action and lay upright alongside the dock wall. In considering the problem involved, it was found that the dock level could only be reduced to a degree, which would leave 10-ft. of water over her deck, and it was highly problematical if such pressure would be withstood when pumping out. It was decided, however, to accept this risk. The further risk entailed by raising the vessel with the enormous jib in situ, however, was too great, and this jib and much top-weight was removed by operations conducted from the shore. The damage to the vessel was located by divers and found to be confined to three only of the many compartments which formed sub-divisions of the vessel, and these were sealed off with cement boxes, etc. The means of pumping through the 10-ft. of water over her was effected by the sealing of all deck openings, and the attachment of the numerous pump suctions to the several compartments by water-tight connections. The pumps themselves were placed on rafts, boats and nearby camels, over and around the vessel. As soon as pumping commenced, the deck, about which doubts had been expressed, exhibited distinct signs of strain and buckling, but fortunately still held intact. It was planned to raise one end of the vessel at a time, and the first part of the programme eventuated without a hitch; but in the middle of the second part of the operation, and which was taking place in the dark, a severe air raid occurred and, as the operation could not be suspended, was completed under difficulties. The vessel was dry-docked, repaired, and resumed urgently required service as soon as possible.

Another method of dock salvage is illustrated by the case of a motor-vessel which capsized as the result of a fire aboard her. She lay on her side, with her bilge just clear of the wall, but which would render uprighting difficult, as it would then "take up" against the wall. To reduce this friction, greased railway rails were placed up and down the wall, upon which the bilges would "take." After several days of arduous work and many difficulties, 9-in. parbuckling wires were placed around, and in position, on the vessel and the camels "pinned." As foreseen, the bilge of the vessel took heavily upon the rails and several wires parted with the strain, the vessel's plating was severely torn in several places of attachment. The operation was repeated several times, with a slight uprighting gain on each occasion, until at last the vessel was sufficiently upright to allow the underside of the engine room skylight to clear the water. Pump suctions were then placed in this compartment, and by the amount of buoyancy thereby obtained enabled her to be completely uprighted and subsequently pumped out and refloated.

An entirely different method of salvage was employed in the case of a large bucket dredger, which capsized and sank in a dock, and lay with her deck against a small jetty on the dock wall. The uprighting had therefore to be effected from the opposite side of the dock. It was first necessary to remove the ladder and entire chain

Marine Salvage—continued

of buckets, and this was done by a combination of diving and surface activities. The uprighting was performed by the erection of six 15-ft. tripods upon the vessel's side. Immediately upon the opposite side of the dock, an equal number of steam winches, with steam from portable boilers, were mounted upon a concrete bed. One hundred ton purchases were then rove between tripods and winches, and when the moment came, she uprighted perfectly easily. Owing to her peculiar form of construction, and the restrictions with regard to the lowering of the dock level, it became necessary to effect removal of the vessel by direct lifting. This was done by four 500-ton camels and 9-in. wires, and although the highest possible tide was chosen for removal from the dock, the vessel only cleared the lock sill by the hazardous margin of 3-in. On passage across the river, an unpleasant thrill was experienced by the narrowest " miss " of a collision with another vessel, which, if it had eventuated, would have caused a serious casualty. After beaching, the dredger was cleared of several hundred tons of mud, refloated and repaired.

Another case, involving several entirely distinct operations, to complete salvage, was that of a vessel which capsized in the dock, as the result of severe bottom damage, and sank across one of the corners of the dock. From this position, both uprighting and lifting were impossible, until one end of the vessel had been removed from the corner. Wires were placed under the forward end by camels and by a combination of heaving by wires, and pulling by tugs, the bow was moved to a suitable position for further operations. The vessel was now blocking a passageway, and removal was urgent, but restriction of width of passage made removal from that particular dock system impossible. An adjoining and shallower branch dock, which was full of obstructions from recent severe air raids was therefore selected for the next step in the operations and was carefully surveyed and a passage buoyed for the wreck. She was then removed by lifting, into the selected berth in this branch. This dock was then " run down " sufficiently to expose the bottom damage, which was patched with heavy logs. Upon completion of this phase, she was uprighted—and as the culmination of operations, pumped out, refloated and removed.

Casualties occasionally happen, which are quite out of the ordinary, and which require special consideration, and departure from the usual methods of salvage. An illustration of this can be given by the case of a large coasting steamer which came into collision with another vessel in the river of a port, and was abandoned by her crew. She drifted up the river and finally stranded and capsized on to her side, athwart the tide, and with 20-ft. of her forward end inclined upwards upon a slipway of a shipbuilding yard. She was severely holed beneath the stem, in addition to extensive side damage amidships—and fortunately, on the upper side, as she lay—from the collision. The first necessity was the removal from the slipway. The forward hole could not be dealt with in her then position and a forward bulkhead was built abaft the damage with great difficulty. An amount of buoyancy was obtained in an additional compartment, forward, and the remainder of the hold was packed with heavy empty oil drums. A winch was available on the river wall about 300-ft. from the vessel, and wires were attached from her bow, to this, and to a salvage vessel moored alongside the winch. The wall on which she was resting was heavily greased, and successive heavings drew the bow clear of the slipway, and into a favourable position for further operations. On successive tides, the vessel was uprighted, pumped out and refloated.

A peculiar incident, although divorced from actual salvage, occurred, which gave rise thereafter to the vessel concerned, to the appellation of " The ship that docked herself." One of the port's hoppers stranded in a subsidiary channel, leading into the river mouth. A salvage party boarded and examined her, but were forced to abandon her by weather conditions. During that night, the salvage vessel remained in close attendance upon the wreck, on the chance of the vessel refloating, and drifting into the river, and becoming an obstruction to shipping. A gale, with heavy and blinding snow squalls prevailed continuously, and at daylight, the wreck had disappeared. A search was made, and the salvage vessel finally returned to port to learn upon arrival that an abandoned hopper had " docked herself " in her regular dock on the previous tide. Actually, the vessel had refloated on the flood tide, and been carried into the river by the prevailing wind and tide, and drifted along the line of river wall, from which, she had been kept clear by the backwash of the waves, and carried by indraft into the first dock entrance, which happened to be her usual docking place.

Marine salvage is by no means all " fair weather, and easy money." Interruptions, setbacks and disappointments, due to weather and other causes, abound. An illustration is that of a hopper, capsized and sunk in the river. It was decided to make a "lift" and after several days of laborious work, all camels and wires were in position and ready for the " pin." With the advent of the flood tide, came a gale which necessitated the abandonment of all operations. Upon the arrival of suitable weather, the " mess " was cleared up and all preparations again completed. Again, the weather intervened, and the same disappointment, and repetition of work ensued. At the third attempt, the operations were successfully concluded, and incidentally, just in time to avoid interruption of the usual Christmas festivities for the salvors.

There is probably no experienced salvage official who can deny having incurred failures, during his career, albeit for reasons not under his control. Here are two such instances. A fine passenger vessel stranded on a revetment and " sat comfortably," and given continuance of the existing fine weather, success seemed certain. The necessary amount of lightening for refloating on the earliest suitable tide was completed, but a few hours before refloating operations were due to be made, one of the severest gales ever known locally, set in, and as it was quite impossible to effect any connection between the waiting tugs and the ship, the salvors had perforce to stand by with the mortification of watching her ultimately break completely in two halves and sink.

On another occasion a message was received that a large vessel was in a sinking condition about 30 miles outside the port. The Port Salvage vessel with tugs, at once proceeded out and found the vessel at anchor, and abandoned by her crew, who had boarded a nearby tug. In spite of a considerable sea running, the salvors made fast alongside and transferred their pumps to the vessel, which was floating very deep forward, with 2-ft. of water over the whole of the foredeck. The damage was confined to the forehold, but the after bulkhead of this hold was being subjected to a heavy strain, and if it collapsed, the vessel would have foundered at once. Upon assurance from the crew that the leakage as the result of a collision was small, and that the vessel had taken many hours to fill up the forehold, pumping was commenced, but was soon discontinued, as the water was quite obviously uncontrollable. The vessel was then taken in tow—stern first, and " lightly " beached inshore, for temporary patching of the damage, at low water. That evening, however the weather got worse, and blew a full gale, and necessitated the summoning of the lifeboat to remove the salvage party. The vessel broke her back and became a C.T.L.

Marine salvage also provides its humours—of a kind! On a certain occasion the Chief Salvage Official of the port was personally conducting operations at a wreck, and walking the deck of a camel, preparatory to " lifting " on that tide. He had been engaged almost continuously for several days, and during his perambulations, fell asleep, and walked over the side into several feet of water—and mud! His rude awakening by the icy cold immersion, with the addition of a plentitude of mud adornment, provided much amusement—to the beholders!

Another incident occurred during operations on a cattle steamer, in the removal of her beasts, as she lay capsized. These were released and committed to the water, to fend for themselves. At a moment when hundreds of cattle were uncertainly milling around in the water and jostling one another, one of the salvage staff fell into the centre of the seething mass. The expression on his face, and his bawls for help, as he came to the surface, face to face with an equally terrified animal, was intensely ludicrous.

Port, and indeed, all marine salvage work has, in addition to its successes, set-backs and failures—its own particular and not inconsiderable risks.

The diver, in his exacting operations in muddy tidal waters; activities, involving exploration of, and work in restricted and intricate spaces; handling of explosives; and all the diverse duties

Marine Salvage—continued

which the exigencies of different situations demand. The dangers, from parting wires, etc., to all personnel engaged nearby.

Risks involved in operations on spirit-laden vessels and on stranded oil-burners. In one such latter case, two salvage officials emerged from the shaft tunnel of the vessel, after an inspection there, exactly three minutes before a raging fire broke out in the engine room, which would have hopelessly trapped them.

In another case, a vessel actually capsized during operations and "ditched" all personnel and gear engaged on her.

Marine salvage, and particularly in a port, where it provides problems in a more diversified form, than those of ordinary "deep-sea" character, is a fascinating, albeit also, a most exacting occupation. Its demands are great, but its contribution to the sense of personal triumph—through success—is most generous, with the additional feeling that the prestige of the port has thereby been increased.

Correspondence

To the Editor of *The Dock and Harbour Authority*.

Dear Sir,

The Future of British Ports and Canals

I have read the paper presented by Mr. W. A. Flere at the Institute of Transport and reported in your May issue, and the correspondence on the subject which appeared in succeeding issues, and have discussed the matter with some of my colleagues in the Wash Ports Group of Employers who have requested me to ask you to grant space for a few comments on some of Mr. Flere's suggestions.

I do not know whether the Wash Group of Ports (which by the way can handle vessels of over 3,000 tons deadweight) is included by Mr. Flere amongst those from which trade should be diverted or whether it is in the favoured category which is to be fostered "in every way." It may not be out of place to suggest that the value of a port does not entirely depend upon its size. I believe that the service rendered by this group of ports compares favourably with that given by its larger neighbours. However, for the moment, I do not wish to develop that argument, nor do I wish here to discuss the question of grouping of ports in general. The point to which I wish to draw particular attention is Mr. Flere's suggestion that the Wash Group of Ports should be divided up, placing Boston in one area and King's Lynn in another. What is to be done with Wisbech, which lies between the two, he does not say.

The Wash Ports are a natural geographical group and are already closely connected for many purposes. They have a common rates structure which is laid down, in general principles, by a combined committee of Employers and Workers, consisting of members from each of the ports. They are (in combination with the Ports of Lowestoft, Yarmouth and Ipswich) a group under the Dock Workers' (Regulation of Employment) Act and transfer of labour takes place frequently and without friction in the Wash Ports Group. Moreover, the group has representation, as a group, on the Council of the National Association of Port Employers.

In these matters, and in many others, the Wash Ports Group has worked together for a lengthy period, and it is difficult to suggest what could be gained by splitting up a group which is so closely and harmoniously united. On the contrary, it is easy to see that a good deal could be lost.

Mr. Flere's paper raises many other issues which call for criticism, but I am not asking you for space to deal with them here; no doubt, before any such scheme as he contemplates would be put into operation, an opportunity would have to be given for the appropriate Authorities and Traders to express their views in the proper quarters.

With regard to Mr. Flere's letter in your August issue, I fail to see that this shows any reason to draw the conclusion that the public interest would be served by breaking up the arrangements which have so long existed in this group of ports. These arrangements have proved to be effective in securing the smooth working of the ports and it appears to me that Mr. Flere's letter does not indicate that any good purpose, either nationally or locally, would be served by breaking these ports up and amalgamating them into some larger groups.

Yours faithfully,
A. SHEPPARD,
Chairman, Wash Ports Group of Employers.

Wisbech Road, King's Lynn.
30th August, 1948.

To the Editor of *The Dock and Harbour Authority*.

Dear Sir,

The Future of British Ports and Canals

With reference to Mr. Flere's reply in your August issue to my previous letter to you on this subject, I would suggest that it is not only the provisions of Section 66 of the Transport Act, 1947, which have to be taken into consideration.

This section and other relevant sections of Part IV of the Act are really only the machinery to implement the intentions previously expressed, particularly by Section 3 (1).

Section 3 (1) states: "It shall be the general duty of the Commission so to exercise their powers under this Act as to provide, or secure or promote the provision of an efficient, adequate, economical and properly integrated system of public inland transport and port facilities . . ." How is the Commission to do this without having regard to every trade harbour, however small it may be?

Even so, local autonomy is unaffected by the passage of the Act into law. Mr. Flere says that British ports have been "taken over by the Docks & Inland Waterways Executive." The fact is that, apart from the railway docks, no ports have been taken over. The function of the Commission in regard to keeping all trade harbours under review has been delegated to the Executive, who, in due course, will advise the Commission as to the exercise of the Commission's powers under the Act. But before the present administration of any port can be altered there has to be consultation with the local interests and, if necessary, public inquiries and special Parliamentary procedure.

Mr. Flere appears to base his arguments upon the hypothesis that the Commission's duty is to restrict development, enforce grouping, and in general place all ports in a subordinate position to the Commission and its Executive.

We think the Commission is intended, through its Executive, to assist and develop the trade harbours with a view to integrating them with the inland transport system of Great Britain. Grouping may be a possibility, but it is not the objective.

All the matters raised by Mr. Flere will, sooner or later, be the subjects of detailed consideration during the Executive's review and any consultations and inquiries which may follow. We prefer to await the result of these official deliberations.

Yours faithfully,
TOM A. VALENTINE,
General Manager and Clerk.

The King's Lynn Conservancy Board, Norfolk.
29th August, 1948.

King Edward VII Hospital for Officers.

Her Majesty Queen Mary has graciously consented to open King Edward VII Hospital for Officers at Beaumont House, Beaumont Street, London, W.1, on October 15. The hospital has two wards of five beds and two of two beds, where nursing and maintenance will be free. There are also 17 single rooms, for which the charge will be much less than it would be elsewhere in London. Patients make their own arrangements with their physicians and surgeons.

Regular and retired officers of the Royal Navy, the Army, and the R.A.F. are eligible for admission; also all temporary officers of all three Services who fought in the 1914-18 or 1939-45 wars, provided they become subscribers. The annual subscritpion is £1. Applications should be made to the house governor, Beaumont House, Beaumont Street, W.1.

Sister Agnes founded this hospital in 1899 at 17, Grosvenor Crescent. Between then and 1941 over 10,000 officers were patients. The premises were badly damaged by bombs in January, 1941, and the hospital had to be closed. It is now being re-opened as a hospital equipped on the most modern lines.

Accident Prevention in the Pacific Coast Maritime Industry

By JOSEPH H. TRAVERS
(Manager, Accident Prevention Bureau of the Waterfront Employers' Association of the Pacific Coast).

That accident prevention is practicable in longshore work has been successfully proven in Pacific Coast ports of the United States. In the Port of San Francisco, in 1927, the accident rate was 231 lost time accidents per million man-hours worked. In 1947 it was 82 lost time accidents per million man-hours. Comparable progress has been made in other Pacific Coast ports and the combined picture for all ports from 1930 on is shown in the accompanying chart.

Stevedore work, by virtue of the circumstances under which it is carried on, imposes some difficulties not met with in accident prevention work carried out in shoreside establishments. Among these complications are the following:—

(1) Piers, terminals and vessels on which stevedore work is carried on are neither owned nor controlled by the stevedore; hence he must accept conditions as they exist and so plan his work that it can be carried on in an accident-free manner, regardless of these conditions.

(2) The contractual relationship existing between stevedore and ship operator is such, in this highly competitive business, that the stevedore often hesitates to press the shipowner for correction of the unsafe or hazardous conditions which exist.

(3) There is no uniformity of conditions. Ships vary in type, equipment and in amount of maintenance expended upon them, and the variation in cargoes is infinite.

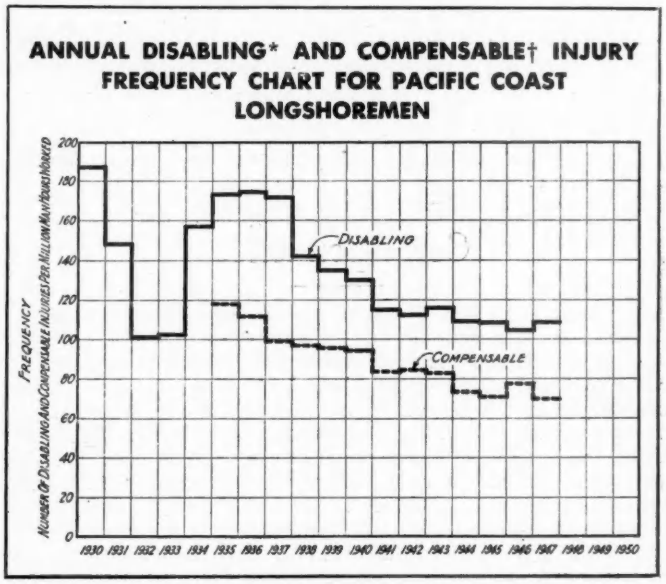
(4) In the United States there are neither government inspections nor rules comparable to the "Dock Regulations" of Great Britain.

(5) Unsettled labour conditions over the past fifteen years have led to distrust and antagonisms between the stevedoring companies and the labour unions, which have been reflected in an almost complete lack of co-operation on the part of the union leadership in meeting the safety issue solely on its merits.

(6) There is a lack of normal employer-employee relationship due to the method of hiring longshoremen. In an attempt to decasualize the industry, all longshoremen (except top foremen) are registered with the hiring hall in the port. Orders for men are placed with the hall, stating only the number and classification of men required. The orders are filled on a rotational basis with regard only to the number of hours worked within the period by the men. This means there is no such thing as steady employment by one company of any one man, nor are there specialised gangs for handling such types of cargo as long steel, lumber, logs, etc.

In view of these problems, the steamship, stevedore and terminal companies realised that a group approach to their problem would offer better chances of success than would an individual-company approach. Hence we have the rather unique fact that this is one of the few industries in the United States in which employers have organised and support a complete accident prevention programme on an industry-wide basis. It may be of interest at this point to briefly trace the growth of accident prevention activities in the Pacific Coast Marine Industry.

That most accidents resulting in injuries to longshoremen are man-made, not Acts of God, and consequently are in a large measure preventable, was realised by the heads of the more progressive steamship companies on the Pacific Coast of the United States along in the middle '20's. First action was taken in the Port of Seattle, where a safety committee was formed in 1924 and a safety engineer was hired to make a study of the accident situation and to recommend correctives. About the same time the stevedoring companies operating on the Columbia River also organised a safety committee and, benefiting by the studies made in Seattle, started active accident prevention efforts. In 1926 the steamship operators in San Francisco were aroused to the necessity for taking active steps to cut down the increasingly expensive toll of accidents — expensive not only in dollars and cents, but in human lives and suffering. Following a six-month survey of operations in this port by a consulting safety engineer, they determined on an organisational programme, which was instituted in 1927 and eventually became coast-wide in scope.



During the past decade, disabling and compensable injury frequencies have been reduced 40 per cent.

The increase in the accident frequency rate noted first in 1934 coincides with the beginning of disturbed labour relations. The following factors are believed to have influenced this trend:

1. Rotational hiring. (Under this system the men no longer work regularly for one employer, but actually rotate from one dock to another.)

2. Loss of specialised gangs. (The men no longer specialise in working one type of cargo, but work any and all types.)

3. The Companies' safety programmes were hindered by the fact that new gangs reported to work nearly every day and no continuity of education could be maintained.

From 1937 on, the trend has been down. This slow reduction in frequency rate has been due to management's successful efforts to better conditions and practices and to efforts of many individual longshoremen to work safely.

To-day it has reached approximately the same point where it was before rotational hiring began. Unless other disturbing factors are injected into the picture, the rate should continue on its downward trend.

*A disabling injury is one which keeps the man off the job on his next regular shift.
†A compensable injury is one which keeps the man off the job for more than 7 days.

The organised accident prevention programme is carried on under the guidance of the Accident Prevention Bureau of the Waterfront Employers' Association of the Pacific Coast. The membership of the Association consists of stevedoring companies, terminal companies, and those steamship companies—both foreign and domestic—which operate dry cargo vessels calling at Pacific Coast ports. The Bureau maintains its head office in San Francisco, with a manager who also acts as chief safety engineer for the sponsoring association and for the individual companies. The major part of the Bureau's work is concerned with stevedoring operations. To facilitate administration of the programme, the Accident Prevention Bureau has district offices located in each of the four principal ports on the coast, San Francisco, Los Angeles; Long Beach Harbour, Portland; Oregon and Seattle, Washington. In addition to the necessary clerical help, the district offices are staffed by a supervisor and three assistants in San Francisco; a supervisor and one assistant in the Los Angeles-Long Beach area; a supervisor and two assistants in Seattle, who administer the work in all the Puget Sound ports; and a supervisor in Portland looking out for operations on the Columbia River.

In San Francisco, at the head office, there is also one supervisor who devotes his efforts to the safety programme for seamen on

Accident Prevention in the Pacific Coast Maritime Industry—continued

the American ships which operate out of West Coast ports. This portion of the programme is supported by the Pacific American Shipowners' Association.

The Bureau is purely a staff organisation. Its personnel make recommendations to the various steamship and stevedoring companies, but they have no police powers.

The basic approach of the Bureau has been one of education. Educating the employers to the necessity for continual accident prevention efforts, then foremen as to their responsibilities, and finally the individual workman. The Bureau has taken as its guiding principle, that "accident prevention, to be effective, must be thoroughly integrated with the work." The responsibility for seeing that the operation is carried on safely must rest on the foreman in charge. It must be further recognised that, in order for the foreman to be interested in making accident prevention a part of his job, company executives must take and maintain a deep interest in making accident prevention an integral part of the work and must make this interest evident to their subordinates.

A poor work surface due to missing and ill-fitting hatch covers.

Well-built hatch covers make a safe place to work.

To aid the Bureau in formulating its policies and to advise it as to practical application of its recommendations, there are in each district Accident Prevention Committees meeting monthly with the Bureau supervisors to discuss various problems which the industry must face. These committees are composed of executives of the stevedoring, steamship and terminal companies and are usually superintendents or managers of their respective companies.

One of the early concerns of the Bureau was to have developed a safely code which would serve as a minimum safety standard for the industry. The Pacific Coast Marine Safety Code was developed under the sponsorship of the Bureau in 1929 by committees representing the ship operators, stevedores and longshoremen. It was adopted as a voluntary code and has been very useful in establishing a standard for conditions and practices aboard ship as far as stevedoring safety hazards are concerned. Although it was a voluntary code with no means of enforcement, save that of moral suasion, a good measure of compliance was had and as a result unsafe conditions aboard ship, such as poor hatch covers, poorly maintained winches, poor or no gang-planks, have been reduced to a minimum. In 1946, as a result of negotiations, the Code was made a part of the labour contract, with the result that the rules are now as enforceable as are any other parts of the contract, and through the same agencies, such as joint Labour Relations Committees, port agents and arbitrators.

In order to learn as much as possible about where accidents are occurring, their causes, and conditions surrounding them, the Bureau has analysed over 114,000 accidents in the twenty years of its existence. In recent years we find that about 20% result from physical conditions. Accidents from actually faulty gear, including outright gear failures, account for less than 4% of all reported injuries. Poor work surfaces, such as those encountered on stowed cargo, are involved in about 5% of the accidents. Unguarded openings and unguarded machinery account for 4%, and poor housekeeping for about 7%. The other 80% are due to such human failures as lack of selection of men, choice of poor work methods, failure to instruct employees properly in how the work should be done, failure to see that orders are carried out, improper planning and, finally, thoughtless work habits of the men themselves.

In order to disseminate accident prevention information to the supervisory forces of the stevedoring companies, the Bureau issues monthly a four-page publication entitled, "The Stevedore Guide." The Guide is directed principally to supervision at the foreman level; it discusses accidents which have occurred; offers suggestions as to safe practices; points out hazards of the industry; and gives tips on foremanship. To reach the workman on the job, the Bureau distributes a monthly time card which, on one side, provides a place for the man to keep track of his time, and on the other deals with some specific operation each month, giving cautions and safety advice.

Efforts to get safety information and accident prevention advice across to the individual worker have been greatly hampered by the labour relations situation over the past fifteen years. In the early days of the Bureau and up until 1934, there was complete management control of operations. During this period safety meetings were held with gang foremen, hatch tenders and walking bosses, at which various phases of accident prevention were discussed. Courses in first aid to the injured were made available to foremen and gang bosses, and also, in two of the ports, to practically all of the longshoremen. It is interesting to note that in the years of 1933 and 1934, by which time most of the first aid training had been given, the disabling injury frequency was the lowest this industry has experienced. This was not coincidental, for it has been the experience in most industries where first aid training has been undertaken, that the interest aroused through it carries over into the work and results in men becoming imbued with the idea that accidents can be prevented by their efforts.

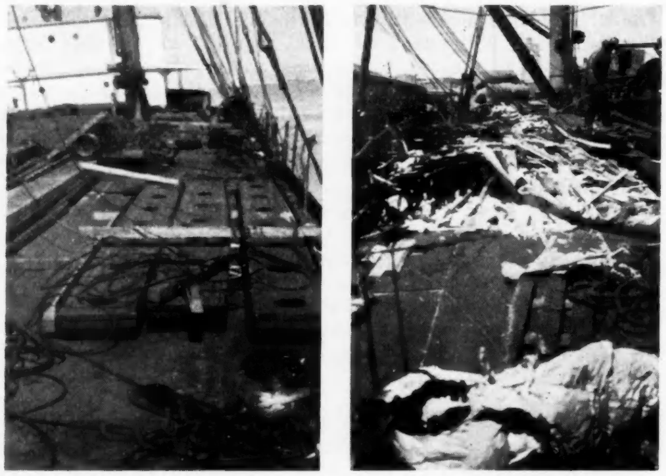
The longshore strikes of 1934 and 1936, which involved all Pacific Coast ports, resulted in a loss of management control and the industry headed into a period of domination by the labour unions. In the union's efforts to build union solidarity and break down loyalty to employers, they discouraged the attendance of their members at any employer-sponsored meeting such as the Bureau had previously held. Efforts have been made at frequent intervals since 1934 to revive safety meetings and first aid classes for the longshoremen, but without success.

On-the-job inspections of stevedoring operations, including inspections of ships for physical hazards, and observance of work practices and work habits of the longshoremen, are among the more important duties of the Bureau representatives. Emphasis is placed on maintenance of gear and equipment, first, because properly maintained equipment is less subject to failure and furnishes a safer work place through the actual elimination of hazards and, second, because with the employer's sincerity of interest in accident prevention demonstrated by good working conditions, it becomes easier to interest the workmen in doing their part towards preventing accidents.

United States stevedoring practices differ from European in that in West Coast United States ports few shore-side cranes are used in handling cargo. Most cargo is loaded and discharged with ships' booms and winches. Thus the drive for maintenance of ship's gear in good condition is an important part of the programme, and efforts are made to impress ships' officers with the necessity for properly maintaining and thoroughly inspecting ships' gear before rigging it and turning it over to stevedores for use. When the Bureau's representatives find conditions aboard ship which need correction, they bring these to the attention of the vessel's officers and request their co-operation in obtaining corrections. Where the conditions noted are such it is obvious they are not correctible at once, then these conditions are reported in writing to the steamship companies and their co-operation requested in effecting the necessary repairs and corrections. Not only has the response of American owned steamship companies to these requests been on the whole satisfactory, but the American

Accident Prevention in the Pacific Coast Maritime Industry—continued

agents of foreign flag vessels have co-operated by transmitting the recommendations to their principals. This does not mean that all conditions are perfect, but it does mean that the companies do their best towards correcting them.



Poor housekeeping. An unsafe place for deck men to work.

Another of the items the Bureau has placed great stress on is housekeeping—the keeping of work places in ship-shape condition. While the ship has some responsibility in this, the larger part falls upon the stevedore. The neat stacking of strongbacks and hatch covers, the coiling up of lines, placing of spare bridles and slings out of passage-ways and working areas, the picking up of dunnage as it is discarded, all play an important part. If the workmen keep the decks and holds cleaned up as they go along, the problem of housekeeping is not difficult of solution. However, if tools, lines and dunnage are just thrown about with the thought that it will be picked up later, then maintaining good housekeeping becomes difficult. There are two reasons for insisting on good housekeeping. First, a clean, well-kept workplace affords a safer, more efficient place to work, because tripping and stumbling hazards are removed and, second, when a proper example is set the workmen, it is much easier to obtain their cooperation in practicing safe work habits.

Where unsafe conditions resulting from stevedoring operations or unsafe practices or acts are observed, they are brought to the attention of the stevedoring foreman on the job with the request that he take the necessary steps to effect correction. Not so much success is had in getting correction of work practices and habits. This lack of success stems from the antagonisms between the men doing the work and the supervisory forces. It should be pointed out here that there is a distinct difference between the attitude of many of the individual longshoreman and the attitude of the union official. Co-operation of the union in safety matters is frankly non-existent. However, there is a great deal of cooperation on the part of the individual longshoreman and foreman.

It may be noted on the chart previously referred to that, following the low level reached in **1933-34**, injury frequency increased greatly. This is attributable to the upset conditions and lack of control due to the strikes. After the **1936-37** strike, the situation stabilised to some extent and since then there has been a reasonably steady decline in injury frequency. This results both from the bettering of physical conditions aboard the ships and on terminals, and from the individual work of the foremen and men in trying to do things the safe way.

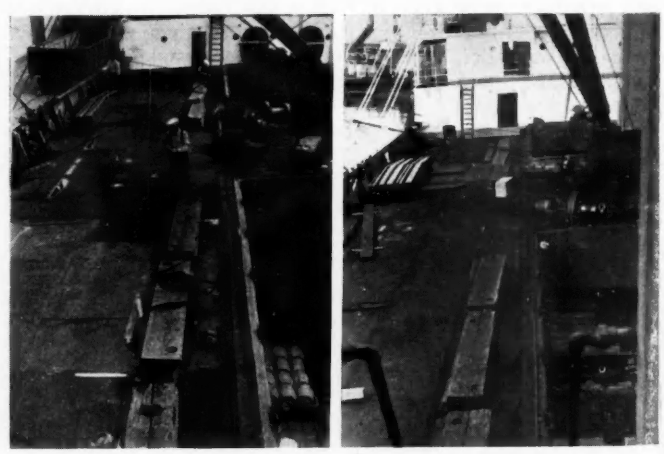
It is interesting to note that despite the large influx of green men to the industry during the war years, there was only a very slight rise in **1943** and the trend from then on continued down. The fact that there was not a greater rise with all these green men reflects the results of the accident prevention work which had been done in the past years and the interest taken by supervisors in carrying out in so far as possible the lessons in accident prevention which they had learned.

As has been mentioned previously, **80%** of the accidents now result from human failure. Under present conditions, progress in reducing the number of these accidents will be slow. However, should there be a change in labour relations which would permit the training of all foremen in the principles of foremanship and particularly in their responsibilities and duties in accident prevention, the inauguration of training for such specialised workers as winch drivers, hatch tenders, lift truck and tractor drivers, and finally an approach to the individual longshoreman with instruction in correct work habits, then a more rapid decrease in the injury frequency rate can be confidently anticipated.

The foregoing remarks have been concerned principally with the accident prevention programme for the stevedoring industry. The programme for seamen's safety is confined almost entirely to written material furnished the officers of the ships. A monthly bulletin, entitled " Seamen's Safety Guide," is directed to officers and department heads aboard the ships and discusses accidents and supervisory control methods. Safe Practice Pamphlets covering various operations aboard ship are issued at monthly intervals. A one-sheet publication suitable for posting on crews' bulletin boards discusses typical accidents of the type that can be prevented only by the man himself. In addition, safety committees have been established aboard many of the vessels. These committees consist of one or more licensed officers from each department and concern themselves with discussing accidents which occur aboard the vessels, accident-producing conditions which are found, and various other safety matters. Many of these ship committees send copies of the minutes of their meetings to the Bureau, where they are carefully reviewed and answers are written to the masters of the various vessels offering comments and suggestions on their meetings.

The Bureau also provides a weekly safety poster service to both the ships and the stevedoring industry. It recognises that these posters at best are only reminders, but every effort is made to make them as attractive and interesting as possible, with a view to keeping the subject of accident prevention ever before the men actually doing the work.

In summary, the Bureau is a staff organisation of an association of employers. It can recommend only. It has no police powers. It is effective only to the extent that its influence and advice are accepted by the member companies and transmitted through them to their supervisors and then translated into action by the men on the job. The programme has succeeded in reducing accident frequency among longshoremen on the Pacific Coast some **43%** since **1930**. Continued gradual improvement can be expected even under present conditions, but with the advent of improved labour relations, then marked improvements can be anticipated.



Good deck conditions, both offshore and inshore. A safe place to work.

Mechanisation ot Cargo Operations at Ports

Present Methods and Probable Future Policy*

By F. H. CAVE, M.Inst.T., Deputy General Manager and Secretary, Mersey Docks and Harbour Board.

A well-known advertisement tells us " Not too little; not too much; but just right."

Here in a nutshell we have the problem of the mechanisation of cargo operations and it is a problem which has no one answer. The extent to which mechanisation is possible and desirable must depend upon many factors which differ in each country and in each port, even on each quay. The purpose of this paper is not, therefore, to instruct in the type or quantity of mechanical appliances which should be used on a particular quay, but rather to examine the development of the chief of these methods; to sketch the uses now made of them; to try to estimate their value; and, with great diffidence, to hazard a guess as to their future trend. The extent to which it is desirable to mechanise any particular dock work is a matter which must be left to the balanced judgment of each port authority and operator. It should be clearly understood that this paper deals solely with the mechanisation of the handling of *general* cargoes and does not attempt to examine the effect of the very highly efficient appliances provided for specialised cargoes such as grain, ores and many other commodities.

It is generally considered that the mechanical age, as we call it, started with the realisation by Watt of the potentialities of steam, and steam winches were the first mechanical appliances to be used for cargo handling. There was then a long pause. Casual labour at the ports was cheap and plentiful. It could keep goods moving approximately as fast as the ship's derricks could work. All was well with the world.

The first move in the mechanisation of dock facilities, as distinct from ships' gear, was also directly related to discharging and loading operations. On this side of the Atlantic, quayside cranes were introduced; in America, the cargo hoist system was invented. It is perhaps permissible to think that in those days the close interconnection of the speed of working ships with the speed of handling the goods on the docks was not fully appreciated; but casual labour on the quays was still, in the main, able to cope with the amount of mechanisation which had developed prior to the first World War.

There are many phases of mechanisation in industry which have received an immense impulse from the impact of the two world wars. Transport in all its forms, including dock work, is one of them. Speed in every operation became vital, cost becoming a secondary consideration. The manpower of the nations was drained and machines had to be invented or improved to supplement it. Small portable (but not self-propelling) cranes had become almost a commonplace on the docks by 1918. Dock operators began to realise that mechanical appliances might pay a dividend and in the years between the wars there was a tremendous increase in the number of appliances which came into common use on the dock quays. The portable cranes became self-propelling. Improvements in design increased their usefulness tenfold and diesel engines began to come into the picture.

In addition to cranes, whose main function was to lift and lower goods, that is to say, to move them in the vertical plane, mechanical trucks, both electric and petrol driven, were widely developed to move them on the horizontal plane. It was only a question of time before an appliance was developed which would combine these two movements in the one machine; and on the outbreak of the second world war we in this country were experimenting with new types of mobile cranes and, somewhat tentatively, with larger mechanical trucks with a light crane mounted on the platform, whilst in America the fork lift, or chisel truck, had begun to emerge.

* Paper read before the Western Section of the Institute of Transport at Bristol on September 26th, 1947, and reproduced by permission.

The second world war gave a further and tremendous impetus to all these developments. Economy in the use of manpower became increasingly important, and financial economy was once more of secondary consideration. The speedy turn-round of ships carrying cargoes quite abnormal to peace-time needs became a matter of vital necessity for the national survival of all those countries involved in the war. It is probably true to say that the Liverpool docks increased their mechanical quay equipment by close on 1,000 per cent. during the war years and this is equally true of most great ports both on this and the other side of the Atlantic. The mechanisation of cargo operations at ports certainly came into its own, though it did not alter radically in design, and there are those who say, and not without some justification, that mechanisation became unbalanced and uneconomical.

It is well to review the position to see whether we may perhaps have gone too far in too short a space of time and without a proper realisation of the consequences of such rapid development. Before doing so, it will be worth while to examine one or two of the principal methods of mechanisation in use to-day and the probable trend of future investigation and policy.

Methods

There is nothing very new in the developments which have taken place in this country for the transfer of goods between ship and shore. Over here we have kept to the old idea of quayside cranes, generally of the luffing and slewing variety, and, although we have increased their number, speed and lifting capacity, there has been no radical change in type during the past 20 years. The real point of interest in regard to this part of mechanisation lies in the difference in practice between European ports where discharging and loading cranes are normally provided, and American ports where such provision is an exception even at recently constructed berths.

American ports expect ships to discharge and load with their own gear and in the majority of cases port equipment does no more than to assist the ship by the provision of cargo hoists or Burton Falls. These consist of girders suspended high above the quay to which blocks are attached so that the quay fall lands the goods at the shed door. Portable winches are installed in the sheds to work the quay fall, thus augmenting the ship's gear. Several port officials and working stevedores who have recently visited America have been extremely impressed by the economy and simplicity of this method. The initial cost is small compared with the provision of high capacity cranes; working parts which are likely to involve high maintenance costs are reduced to an absolute minimum; and if the ship's gear is in good working order the operation is as speedy and efficient as can be produced in practice by ordinary cranage. Many leading American stevedores seriously argue that cargo hoists actually provide a more efficient method of discharge and loading than do cranes, provided that the quay margin is not more than 40 feet wide, and they maintain that the only theoretical advantage of a crane is that it will slew, which they say is in any case a waste of time, since the object to be achieved in the transfer of cargo between ship and quay is to move the goods by the quickest, and therefore the shortest route, which automatically eliminates slewing. There is a strong case to be made for the use of cargo hoists at berths which have a margin of not more than about 15 feet between ship and shed, and it is suggested that this method, which has been in operation in America for many years, should be given a serious trial in this country as soon as the supply of steel will permit.

It is, however, in the realm of mechanical appliances for use on the quays themselves that the greatest advance has been made in recent years. We quickly developed from the transportable to the self-propelling mobile crane and from the somewhat rudimentary mechanical trucks of 25 years ago to the extremely efficient and economical electric and petrol trucks which are used in large numbers to-day. By far the most important advance, however, has been from the separate dimensional movements of cranes and trucks to machines with a dual movement, culminating in the fork lift or chisel truck now universally used in America.

The advantages of mobile cranes and mechanical trucks are apparent and well-known and it is unnecessary to deal with them in detail. It is imperative, however, to devote a few minutes to a discussion of the chisel truck, which has taken American operators by storm and is probably the greatest phenomenon of the present day in the mechanical handling of cargo and in its

Mechanisation of Cargo Operations at Ports—continued

potentialities for the future. They are readily adaptable for moving a very wide range of cargo, but their special and most important application is for use with the pallet system. The underlying idea of this system is quite simple, viz.:—that the goods at their first handling on the ship or on the quay should be placed on trays or pallets which can be used both as ship's slings and for piling on the quay, thus avoiding any intermediate handling of individual packages between the vehicle which brings them to the quay and stowage in the hold or vice versa. The pallets themselves consist of wooden or metal trays about 4-ft. by 6-ft. with a double bottom, the two bottoms being separated by three or four spaced cross pieces about 4 or 5 inches in height. Export cargo on arrival on the quay is stowed straight on to these trays, care being taken to make the top of the packages quite level. The pallets are then removed by fork lift trucks, the prongs of which are inserted between the double bottom. They are taken to the proper stowing ground and piled one on top of the other. The only limits to the height to which they can be piled are firstly the height to which the fork lift truck can raise them (say 12 to 14 feet), and secondly the limit to which the lower pallet loads can withstand the weight of those stowed on top of them. When the ship is ready to load the goods, the fork lift truck again runs to the pile, removes the already-stowed pallets one by one and places them on trailers for a tractor to draw to the quay edge. On arrival at the quayside each pallet is attached to the ship's fall by means of two steel bars, which fit into the ends of the pallets between the double bottoms, distance pieces or stretchers being fitted at an appropriate height to prevent the goods being damaged by the connecting ropes. They are slung in this way into the hold, where the cargo is man-handled in stowing for the first time since it was placed upon the pallets.

Precisely the same operation in the reverse direction is carried out on goods of import cargoes. A useful development of this system is the increasing practice of making large cases complete with double bottom so that they can be dealt with in exactly the same way as ordinary palletised goods.

This system of handling cargo is almost universally used in America, but they are not content to confine its use simply to work on the quays. A great deal of investigation is at present taking place into the possibility of palletising goods before they leave the factory, so that they may be carried to the port already stowed in the way in which they will subsequently be delivered to the ships. This clearly involves a tremendous organisation with very wide interchangeability of pallets between the different haulage firms and even between factories, but the system has such a hold on the American mind that these difficulties will very likely be overcome. It is not only at the factory end that the Americans are experimenting. They have taken on the very much more difficult task of evolving a system for stowing the pallets complete with their loads in the holds of the ships. A somewhat inconclusive experiment in this direction was tried by the American Naval Stores Department during the war, and now a commercial start has been made by the Canada Steamship Lines, Ltd., which is building large ships for use on the Great Lakes with specially designed holds served by side ports and lifts, so that fork lift trucks or trailers with their pallets can run straight into the ship from the quay and deposit the loaded pallets in their final stowage.

Many years must elapse before such a perfection of the system can be applied to normal freighters on deep sea voyages and many will doubt whether such a system can ever be generally developed, although it may be found to have great advantages for certain specialised trades. It is, however, a marvellous target at which to aim and the greatest credit is due to those who have refused to be discouraged by the many difficulties which they have experienced and the tremendous organisation which they have had to build up. To take an example of a commodity ideally suited for palletisation, such as canned goods in cartons, it is estimated that, from the first handling after the goods leave the shipper's delivery truck until they are stowed in the hold, the total separate handlings involved in dealing with 70 cartons have been reduced from 210 to 3. Such extraordinary simplification may well stir the American (and our) imagination.

In spite of these tremendous manifest advantages, there are many on this side of the world who doubt the possibility of a wide extension of the use of the pallet system under present conditions. It is argued with great justification that this system is essentially a warehouse system for use with particular types of goods in sound packages of regular size, and that it cannot be applied satisfactorily and economically to the very wide range of small parcels of different marks which make up the average general cargo passing to and from this country. It is also said that it can only be economical if the size of the gangs employed on the quay can be reduced, not only by the elimination of trucking, but also of selecting, weighing, etc., i.e., unless one can mechanise completely, it is not worth while using the pallet system. It is highly probable that in present circumstances there is only a very limited use for this system in handling general cargoes on the quays in this country, but it is a system that holds out such tremendous possibilities that it will be well worth while to spend time, money and imagination in attempting its development and to go to a very great deal of trouble in the effort to eliminate the commercial and industrial restrictions which may at the present time reduce the advantages to be gained from it.

Progress in America

We have a great deal to learn from the Americans in the keenness with which they now investigate and experiment with various mechanical devices both for port work and ancillary services. Until the war we were well ahead of them in dock mechanisation and, with the possible exception of the chisel truck, depending on one's individual views of its usefulness for our types of traffic, we still are. But unless we deal with mechanisation of cargo working in a more scientific and co-ordinated manner they will leave us badly behind. Apart from a Committee which is handling the development of the pallet system, they also have a National Commission to investigate and advise upon the design and equipment of ports. I had the pleasure of meeting the Chairman of this Commission, who is a working stevedore on a very big scale and a man of most open and agile mind. I well remember discussing for two or three hours with him the problem of mechanising the stowing and unstowing of ships. He held very strongly, and without doubt rightly, that until new methods of mechanisation can be more widely introduced on board the ship there is a very definite limit to the amount of mechanisation which it is possible economically to introduce on the dock quays and sheds. He maintained that stevedores are doing their part well and that the next move lies with the naval architects. A moment's consideration must produce the conviction that this is so, since it is futile to provide appliances which can deal with goods to or from a ship at a speed of, say, 50 tons or more per gang hour when the men in the hold still have to do their work by purely manual labour and stow or unstow the cargo at perhaps a quarter of this rate. In any system of industrial mechanisation a bottleneck such as this will upset the economic apple cart. It is good to know that the Americans are giving very serious consideration to the problem, which is a very difficult one indeed and one which does not seem to be receiving sufficient attention in this country.

Economics

What are the advantages which have so far been obtained by mechanisation of cargo handling, and have these advantages been worth the cost?

On looking back at the history of industrial mechanisation, it seems clear that all development has resulted from the achievement of two closely related objectives: (1) The decrease in man hours per unit of production. (2) The consequent cheapening of output. To these should rightly be added in these more humane times: (3) The avoidance of undue physical strain on the workers. Taking these three standards as a guide, what has been achieved?

With very great regret, it must be admitted that the introduction of mechanical appliances on dock quays has failed to produce either of the first two objectives. Exceptions can be claimed in respect of certain of the work (delivery of goods to inland transport for example), but the speed of the overall operations which directly control the loading and discharging of ships has actually decreased since quay mechanisation became a general practice. The output per gang hour may have risen slightly during the in-

Mechanisation of Cargo Operations at Ports—continued

crease in mechanisation between the wars, but dropped heavily during the war period when mechanical appliances were multiplied many fold. There has been no apparent tendency for output to increase since the war and, as the manning scale of the gangs has not been generally reduced, it must be admitted that the cost per ton has increased instead of decreased. The third objective may be said to have been achieved.

It must not be thought that this experience is confined to this country. America, which really only started mechanisation on a big scale during the war, experienced a similar percentage drop in output and, although it is said that this is now improving, it is still well below pre-war (and non-mechanised) level. In other countries, too, the same position obtains.

To examine all the causes for this disappointing situation is quite outside the scope of this paper, but it is necessary to face the facts and to see where and how improvement can be effected.

Whilst it would be economically unsound, and therefore in the long run of no good to anybody, to try to pretend that mechanisation can be on a right basis if it does not increase output, if costs to the shipowner, the operator and the importer are increased, and if it benefits the worker alone, so it would be equally wrong to jump to the conclusion that the benefits to the worker were undesirable or even unnecessary. A greater part of the trouble must be in the policy which led to intensive mechanisation of part of a continuous process whilst part—namely, the work in the ship's hold—remained unmechanised. In addition to the inevitable slowing down of potential output by this bottleneck, it is probable that such a bottleneck has a very adverse effect on the moral of the workers.

It is quite impossible to unmechanise even though we may possibly be over-mechanised in certain respects at the moment. It must be remembered that mechanisation of cargo operations is of quite recent growth and needs time to settle down, and so does the new dock labour scheme. Far greater troubles have faced other industries when they introduced mechanical appliances, and with goodwill and patience the dock industry also will get over its troubles, if it faces up to them. There are many restrictive practices, not only industrial but also commercial, to be broken down. A new spirit of interdependence and team work needs to be built up. Mechanisation needs to be developed on more co-ordinated lines of well balanced policy; and once again be it emphasised that the bottleneck of the work in the hold urgently needs the closest investigation and inventiveness by shipowners and dock operators alike.

Volume of Tidal Water in a River

By M. D. KILFORD
(River Surveyor, Calcutta Port Commissioners).

As a large scale Model of the River Hooghly was being considered, it was necessary to ascertain, as accurately as possible, the maximum quantity of water that would be required in the Model to represent the tidal water in the prototype, and the author devised the method described in this Note which may be of use to other Hydrographical Surveyors.

The data available consisted of accurate charts of the River from the Tidal Limit to the Sea, a distance of about 156 miles, and the Tide Registers for thirteen Stations. The distances between the Stations varied from 5 to 20 nautical miles. Better results would naturally have been obtained had the Tide Registers for more Stations been available.

A March Perigee Spring Tide was selected.

It was found very difficult to take off the surface areas of the various sections of the river with any degree of accuracy especially from the smaller scale charts and it was therefore decided to use the widths of the river at each of the stations.

The word "Discharge" is normally taken to mean the quantity of water passing a certain point in a given time irrespective of the direction of flow. In this Note, however, "Discharge" refers only to water passing down and out of the river on the ebb tide and "Influx" to water entering and flowing up the river on the flood tide.

The form used is as shown below. This also shows portions of the last two sheets of the calculations. The columns are numbered only to facilitate the description of the calculations that follow.

The rises of tide above Low Water are taken out from the Tide Registers and entered in Columns 1 and 4. It will be seen that Columns 4, 5 and 6 on one sheet are duplicated as Columns 1, 2 and 3 on the following sheet. If, as some times happens, two Low Waters occur during the period under calculation the lower

Tidal Capacity of River Hooghly.

Fresh water discharge of feeder rivers 1840 cusecs.
25th March, 1940 (Perigee Spring Tide).

Sheet No.11.

	Station: Balari			Station: Gangra			Distance between Stations 72,000 ft.			At Lower Station: Gangra			
Time	Rise above L.W.	Width	Area of Tidal Water	Rise above L.W.	Width	Area of Tidal Water	Volume in thousands	Difference in half hour in thousands	Cusecs	Volume of Tidal Water in thousands	Discharge or Influx (+ fresh water) Cusecs.	Cross Sectional Area Sq.ft.	Velocity Ft.per sec.
	1	2	3	4	5	6	7	8	9	10	11	12	13
5.30	3.56	16100	57,638	2.00	22100	44,200	3,666,168			15,212,707		418,820	
6.00	2.75	16075	44,206	1.08	22050	23,814	2,448,720	- 1,217,448	- 676,360	12,218,241	-1,665,431	398,434	- 4.18
.30	1.92	16050	30,816	0.33	22000	7,260	1,370,736	- 1,077,984	- 598,880	9,606,217	-1,452,966	381,880	- 3.80
7.00	1.16		18,618	N		N	670,248	- 700,488	- 389,160	7,335,879	-1,263,138	374,620	- 3.37
.30	0.50		8,025	0.33		7,260	275,130	- 395,118	- 219,510	5,469,028	-1,038,983	381,880	- 2.72
8.00	N	16000	N	3.58	22200	79,746	2,861,136	+ 2,586,006	+1,436,670	6,796,918	+ 735,875	454,366	+ 1.62
.30	0.16		2,560	7.58	22400	169,792	6,204,672	+ 3,343,536	+1,857,520	9,553,954	+1,529,849	544,412	+ 2.81
9.00	5.25	16125	84,656	10.67	22600	241,142	11,728,728	+ 5,524,056	+3,068,920	17,779,964	+4,568,167	615,762	+ 7.42

Sheet No.12.

	Station: Gangra			Station: Saugor			Distance between Stations 97,000 ft.			At Lower Station: Saugor			
5.30	2.00	22100	44,200	N	65000	N	2,143,700			17,356,407	-	1,130,000	
6.00	1.08	22050	23,814	0.25		16,250	1,943,104	- 200,596	- 111,446	14,163,345	-1,776,873	1,146,250	- 1.55
.30	0.33	22000	7,260	1.84	65750	120,980	6,219,640	+ 4,276,536	+2,375,853	15,825,857	+ 922,887	1,250,980	+ 0.74
7.00	N		N	3.50	66500	232,750	11,288,375	+ 5,068,735	+2,815,963	18,624,254	+1,552,825	1,362,750	+ 1.14
.30	0.33		7,260	5.16	67300	347,268	17,194,608	+ 5,906,233	+3,281,240	22,663,636	+2,242,257	1,477,268	+ 1.52
8.00	3.58	22200	79,746	7.58	68000	515,440	28,866,521	+11,671,913	+6,484,396	35,663,439	+7,220,271	1,645,440	+ 4.39
.30	7.58	22400	169,792	10.58	69000	730,020	46,640,882	+17,774,361	+9,874,645	56,194,836	+11,404,494	1,860,020	+ 6.13
9.00	10.67	22600	241,142	12.75	70000	892,500	54,981,637	+ 8,340,755	+4,633,792	72,761,601	+ 9,201,919	2,022,500	+ 4.55

N.B. + indicates Influx - indicates Discharge

Volume of Tidal Water in a River—continued

of the two is to be used. By using Low Water there is no necessity to reduce the Tide Readings at each station to a common datum and it also eliminates any error there may be in the datum used at any station due perhaps to sinkage of the Bench Mark or other causes.

The widths of the river at Low and High Waters are measured off the charts and a graph prepared for each Station from which the mean width at any particular rise above Low Water may be easily taken off. The mean widths thus taken off are entered in Columns 2 and 5.

The distance between Stations is taken off the charts by measuring along the centre of the river and this is entered over Columns 7, 8 and 9.

The area of tidal water is found by multiplying the rise by the mean width and is entered in Columns 3 and 6.

The two areas for a particular time are added together and multiplied by half the distance between stations in thousands of feet and the volume thus found entered in Column 7.

The half hourly increase or decrease in volume is found and entered, with the appropriate plus or minus sign, in Column 8. The half hourly difference being in thousands of cu. feet has only to be divided by 1.8 to obtain the Influx or Discharge in cusecs which is entered in Column 9 with the same sign as in Column 8.

Each sheet deals with one portion of the river and the sheets are numbered consecutively from the Tidal Limit to the mouth of the river.

The calculation of the volume described in 2.5 is straightforward provided the tide, at both stations on the one sheet, is either rising or falling. However, this is not always the case as for instance say it is high water at 09.00 hours at the Lower Station and at 10.00 hours at the Upper Station then it is obvious that 0.30 hours High Water will occur somewhere between the stations and the tide will be falling at the Lower and rising at the Upper Station.

If there is only 1 hour between the times of High Water at the two Stations, it can be assumed that High Water occurs midway between the two Stations at the half hour. If the interval is $1\frac{1}{2}$ hours then it can be assumed that at the first half-hour after High Water at the Lower Station it is High Water 1/3 distance from that Station and so on.

The Area of Tidal Water at the intermediate High Waters can be found from the areas at High Water at the two Stations by proportion and the volume found therefrom.

Similarly, Low Water may occur between two stations but as the Area of Tidal Water is nil at Low Water the volume of Tidal Water between the two stations can easily be found by multiplying the area at the Lower Station by half the distance between that station and the point of Low Water and adding the result to the area at the Upper Station multiplied by half the distance from that station to the point of Low Water. If the Low Water is, however, the higher of two Low Waters, it is obvious that the area of tidal water will not be nil and the volume will have to be found in a similar manner to that of High Water already described in the two preceding paragraphs.

If in any doubt, a rough graph of the position will clear this up.

Having completed the first nine columns of all the sheets the remaining columns can be filled in.

Column 10 is the sum total of all the foregoing Columns 7.

Column 11 is the Discharge or Influx in cusecs and is the total of the cusecs given in the foregoing Columns 9 and the fresh water discharge due regard being given to the plus and minus signs.

The cusecs in Column 11 can be checked by taking the half hourly difference from Column 10, dividing by 1.8 and applying the fresh water discharge.

If the mean velocity at any station is required, the sectional area of the river at Low Water at that station is found and the area of the tidal water at the station added thereto to find the sectional area at any particular time. This area is entered in Column 12 and dividing the cusecs by this figure gives the velocity in feet per second.

The normal method of finding the cross-sectional area of a river is to plot the section on squared paper and take off the area with a planimeter. A quicker and simpler method, however, is to place a scale over the section on the chart and take off the depths at equal intervals from one low water line to the other. The sum total of these depths multiplied by the length of the interval will be the cross-sectional area.

The fresh water discharge of the non-tidal portion of the river may be ascertained by actual observations or estimated from the most reliable data available.

If there are any tributaries, these should be calculated separately, if there is sufficient reliable data, and the results added to the first station, on the main river, downstream of the mouth of the tributary.

Staff Changes at the Port of Liverpool

After 26 years' service with the Mersey Docks and Harbour Board, Comdr. A. E. Harbord, R.N. (Retd.), Marine Surveyor and Water Bailiff, retired last month. He has been succeeded by Lt. Comdr. W. R. Colbeck, R.N.R., who has been in the Board's service 14 years.

At one period of his career, Comdr. Harbord was Navigating Officer of the famous yacht, "Nimrod," and accompanied Sir Ernest Shackleton on his Antartic expedition to the South Pole, being later awarded the South Polar Medal. He transferred to the Royal Navy in 1913, where he was allotted special hydrographical duties and other important survey work. Following his service in H.M.S. "Hermes," which was sunk off the French coast in 1914, he served in the sloop "Vestal," and in 1922 was appointed to the Dock Board's service. He was appointed Marine Surveyor in 1947.

In August, 1939, he was mobilised for service in the Royal Navy and was domobilised in 1945. Since joining the Marine Surveyor's Department, Comdr. Harbord has been closely associated with practically all major salvage operations within the port area. He is a member of the Antarctic Club.

Lt. Comdr. Colbeck was born at Hull and from 1929 to 1931 he was navigator of the "Discovery" under Sir Douglas Mawson, of the British, Australia and New Zealand Antarctic Research Expedition, being awarded the Polar Medal. Later he was engaged on the Admiralty East Coast survey on H.M.S. "Fitzroy," and after that as a Hydrographical Surveyor with the Department of Scientific and Industrial Research.

He joined the Board's service in 1934 as a Junior Assistant to the Marine Surveyor and Water Bailiff, and he has been closely associated with the major salvage operations within the port since joining the department.

Lt. Comdr. L. C. Hill, O.B.E., D.S.C., R.N.R., succeeds Lt. Comdr. Colbeck as Senior Assistant to the Marine Surveyor and Water Bailiff. He joined the R.N.R. in 1930. He was Junior Officer in R.R.S. "Discovery 2" from 1930 to 1935 and Commanding Officer of the vessel from 1935 to 1939, on five separate commissions to the Antarctic on oceanographical research, being awarded the Polar Medal.

He commanded frigates and destroyers on anti-submarine duties during the war, and in 1944 he was appointed a River Clyde pilot and in 1946 Junior Assistant to the Marine Surveyor and Water Bailiff.

Lt. Comdr. Hill was awarded the O.B.E. (Civil Division) in 1936 for services in connection with the relief of Mr. Lincoln Ellsworth in the Antarctic and the D.S.C. in 1944 for anti-submarine successes.

Errata.

We regret a printing error in the notice announcing repairs to Queen Alexandra Dock Lock, Cardiff, which appeared on page 113 of the September issue. In line 4, paragraph 3, the width of the Roath Dock Lock is given as 8-ft. This, of course, should have been 80-ft.

Radar Research Installation at Southend Pier

On Monday, August 23rd last, the Mayor of Southend performed the ceremony of opening what is believed to be the first pier-head marine radar research station in the world. The ceremony became possible as the result of the co-operation of the Southend Corporation and Marine Instruments, Ltd., who manufactured the equipment and will operate the station. The set installed is the standard Kelvin-Hughes Marine Radar, which was recently awarded the Ministry of Transport's official type-approval certificate. The set is similar to those already fitted to ferry-boats, cross-channel steamers, Irish mail boats, and to the first British commercial trawler to carry radar equipment.

Marine Instruments, Ltd., as manufacturers of radar equipment, felt the need for means of carrying out research and obtaining operational data under maritime conditions in all weathers. The use of a sea-going vessel for this purpose was ruled out because of a number of practical considerations, and it was found necessary to seek a suitable alternative having, if possible, the advantages of a sea-borne unit without the attendant drawbacks. A site was required which would enable the set to be operated over its whole range, 50 yds. to 27 miles, by day or night and in all weather conditions. A site which would command a busy shipping channel was desirable from the operational point of view. It will be seen that the site finally selected at the end of Southend Pier, one and a third miles from the shore and commanding the Thames Estuary, was an ideal one and possessed the advantage of including within the range of the set the coastline of the South bank of the river.

Training of Ship's Officers

In setting up the station, the makers had also in mind the possibility of providing for ship's officers an opportunity of gaining experience of marine radar operation under conditions which were comparable to those encountered at sea. It was considered essential to provide an opportunity for the man on the bridge to see for himself the simplicity with which marine radar equipment can be operated despite its theoretical complexity. At the new station, therefore, the ship's officer will be able to see a typical marine radar set in operation, operate the simple controls for himself, and satisfy himself as to the advantages and limitations of the latest departure in the science of navigation.

The station will also be used for the training of radar engineers and mechanics.

The new installation also provides the general public with an opportunity of seeing radar in action. On the main deck of the pier a repeater console has been installed for the use of visitors.

Three Compact Units

The station equipment at Southend, consisting as it does of a normal shipboard installation, is constructed in three compact units: the Generator Unit, the Aerial Unit and the Main Console.

The Generator Unit comprises a Motor Generator driven from the main electricity supply on the pier and an automatic starter assembly enabling the motor to be controlled from a master switch on the Main Console.

The Aerial Unit consists of a Modulator, a Transmitter, a Receiver, an Automatic Frequency Control Unit and a Power Supply Unit, all housed in a weather-proof steel container, above which the rotating aerial is fitted, which revolves during operation of the set at 30 revolutions a minute.

The mounting of the transmitting and receiving equipment in close proximity to the aerial gives several advantages. The very high frequency signals which have to be fed to and from the aerial have to traverse a special type of conductor known as the wave-guide. It is most important that the wave-guide should be kept free from any moisture and be protected from any possibility of mechanical damage. The dimensions of the wave-guide have a direct bearing on the performance of the set and in this case the wave-guide length of only 30 inches gives an effective minimum range to the equipment of less than 50 yds. The aerial unit at Southend is mounted 50 feet above water level, clear of obstructions throughout its sweep.

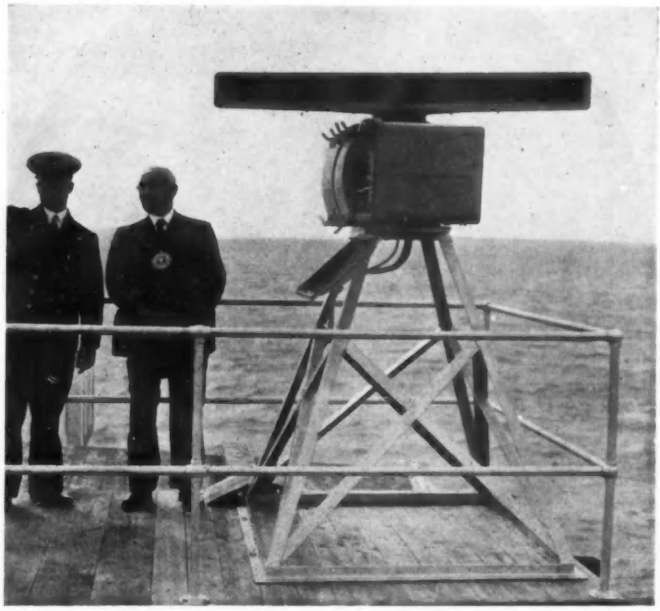
The Main Console, in a building on an upper deck of the pier just below the scanner unit, houses the Plan Position Indicator or radar screen, the Time Base Unit, the Calibrator Unit, the I.F. Amplifier and two power supply units, as well as the motor-generator control.

The complete installation is sub-divided into a number of small inter-changeable units with plugged connections, enabling service and maintenance to be expedited.

The 9-in. magnetic cathode ray tube has a double screen having a long afterglow.

All cabling is screened and suppressors are fitted where necessary. No interference is experienced from outside sources. De-icing equipment is provided for the revolving aerial unit.

The instrument operates on a wave-length of approximately 3 centimetres within the approved frequency band of 9434 Mc/s-9524 Mc/s.



Kelvin-Hughes Radar on Southend Pier.
The Mayor of Southend, Alderman S. F. Johnson, J.P., has the working of the directional finder explained to him by Chief Engineer Goble of the pier staff. Photograph shows the compact design of the aerial unit and the weatherproof container for the transmitting and receiving equipment.

Operation

The entire installation is brought into operation by pressing the single starting control on the Main Console. When this is done the generator starts and runs up to full speed. After a three-minute interval to permit the valves to reach their working temperature, an automatic delay switch switches on the rest of the apparatus and the set starts to function.

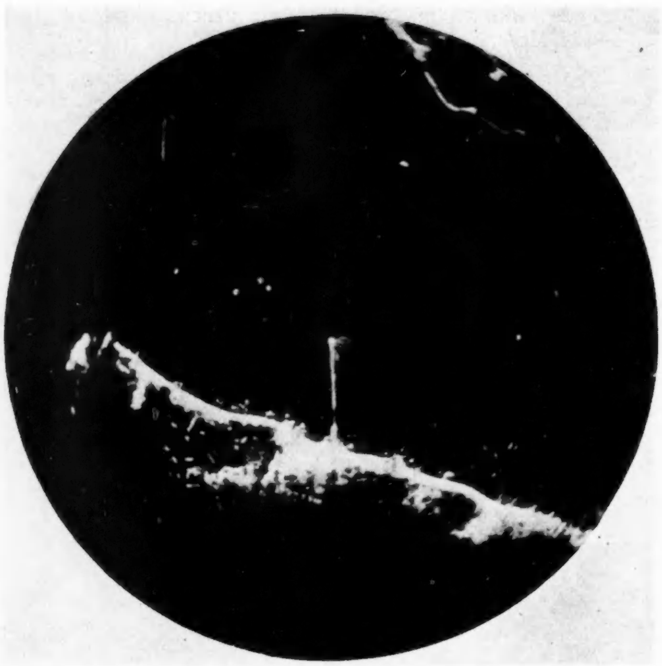
Range control is provided, giving a sweep of from one to twenty-seven miles full scale deflection, variable continuously from one to five miles, then to nine or twenty-seven miles by switch. For chart comparison purposes, an auxiliary display incorporates a continuous control from one to twenty-seven miles.

Range calibration is effected by observing the distance of any recorded object from the centre of the screen and two methods of effecting the necessary measurement are provided. A series of concentric calibration rings are inscribed electronically on the screen and by reference to these rings the range of any recorded object can be estimated. In addition, by means of a control on the Main Console, a single ring variable in diameter from zero to a diameter representing 18,000 yds. can be traced on the screen. After adjusting the control so that this ring intersects on

Radar Research Installation at Southend Pier—continued

the screen a signal from an object, the range of the object may be read off from a dial calibrated in yards.

The bearing of any recorded object can be obtained equally simply. A radial line can be traced on the screen at will, which, in the case of shipboard sets, coincides with the lubber line. A control is provided to set this Heading Line, and when this has been done the relative bearing of any object giving a signal trace on the screen may be obtained by reference to a transparent illuminated scale mounted over the screen. Bearings can be taken with an accuracy of 1° at the edge of the screen. For use at sea, the P.P.I. display pattern may be referred to the compass scale and then coupled to a repeater compass. The display will then be maintained constantly in a North-upwards position, all bearings indicated will be true bearings, and the Heading Line will indicate the compass course of the ship.



The radar view of Southend, as seen by the pier-head scanner. The pier itself, the foreshore and several ships in the vicinity can be clearly recognised.

For taking bearings at very short ranges, means are provided for expanding the centre of the scale to a diameter of 1 inch. In effect all signal traces appearing on the screen are then displaced outwards by half an inch and the angular displacement between them is increased. At the same time, the range calibrations are equally expanded so that range measurements remain accurate.

Provision is also made for the elimination of "sea clutter," the registering on the screen of radio echoes reflected from waves in the vicinity of the ship in stormy weather. A simple one-knob control provides adjustment for all weather conditions.

Performance

The Southend installation will indicate the presence of large vessels at twenty miles, vessels above 2,500 tons at twelve miles, coastal vessels and trawlers at up to ten miles, and wooden row boats up to three-quarters of a mile. Wooden spar buoys can be located up to half-a-mile and large metal buoys up to three miles.

Identical radar sets in use at sea have picked up the sheer rocky coast of Norway at twenty-seven miles, and other lower coastlines of differing types at ranges from sixteen to twenty-two miles.

The minimum range of the set depends on the height of the aerial above water level and is never more than 50 yds. In certain circumstances, the equipment is effective down to 30 yds.

The horizontal width of the beam emitted by the revolving aerial is 1.5°. The vertical beam-width is 27° to give effective operation at minimum range and to allow for rolling up to ± 10°. The "side lobes" of the main beam amplitude are kept down to less than 5% of the main amplitude to eliminate misleading traces on the screen.

The narrow horizontal width of the beam ensures that any two objects at the same range subtending an angle of more than two degrees to each other will be indicated by two distinct signal traces. Objects at the same range separated by an angle the same as, or less than, the beam-width of 1.5° will, of course, give simultaneous reflections and appear on the screen as a single signal trace.

The Southend installation, apart from its uses for research, will do much to convince the mariner that radar is fundamentally simple to operate, and the recordings on the P.P.I. screen easy to interpret after a little practical experience. The confidence which is bound to follow actual operation of a marine radar installation will be enhanced by the knowledge that equipment identical with that installed on Southend Pier has been used by shipmasters to navigate the Mersey to Liverpool in thick fog, to make the passage from London, down the Thames and up to Newcastle without obtaining a single visual bearing, and to bring a cross-channel steamer safely down the River Lee from Cork when all other shipping was immobilised by bad visibility.

The Whangpoo Conservancy Board

Good Progress with Dredging

A report recently issued by the Whangpoo Conservancy Board shows that 2,835,568 cub. yds. of riparian dredging and 699,377 cub. yds. of channel dredging were done in the period September, 1946, to December, 1947. Dwindling of foreign trade and exemption of exports from Customs Duty have had repercussions on the work of the Board, while the monthly allotment of only 2,000 tons of coal against the minimum of 2,600 tons required hinders work. The navigation channel is also being clogged by the dumping of 3,000-4,000 tons of garbage daily by Shanghai. After V-J Day the Board concentrated on riparian dredging to meet the urgent requirements of shipping, and carried out night dredging to expedite the work. It was later seen that the condition of the channel, especially at the Pootung Point, had deteriorated greatly and a large ladder bucket was sent there.

The Board agreed to help the Shanghai Municipal Government to dredge the highly silted and badly congested waterway of the Soochow Creek. The work started from the mouth of the creek and had reached the section between Honan Road and Szechuen Road bridges by the end of 1947.

The Board considers that the principal hindrance to large ships is the Tungsha Bar in the south channel of the Yangtsze Estuary, the depth over the crest of which is only 18-ft. at the lowest tide. Before the dredging of the Yangtsze Bar could be resumed, a new survey of the Bar area would have to be made. Most of the pre-war survey beacons and marks had either been destroyed or were missing, and reconstruction was extremely difficult, but by the end of 1947 three beacons had been re-erected.

A perpetual problem for the Board has been the disposal of several million tons of dredged mud each year. It has been the practice to use the mud for reclamation of the low foreshore area along both banks of the river, and this involves great expenditure and considerable labour. During the period under survey reclamation work totalled 3,620,063 cub. yds.

It is planned, after the Pootung Point work has been completed, to start work at Wayside Bar, Black Point and Astraea Channel, with the purpose of maintaining a uniform depth of 26-ft. below lowest water. The Board's fleet consists of 68 vessels of various types and sizes, compared with 78 before the war, and only 23 in September, 1945.

Notes of the Month

Traffic at the Port of Basel.

Although the country is landlocked, Switzerland ships one third of its imports and exports by water—through the inland port of Basel on the river Rhine. About 8,000 ships dock in Basel each year, and in 1947 approximately 2,000,000 tons of goods were shipped and re-shipped at the port.

Appointment of Dock Manager, Swansea.

The Docks and Inland Waterways Executive announce that they have appointed Mr. W. Jeffers to be Dock Manager, Swansea. Mr. Jeffers, who is at present Assistant to the Chief Docks Manager in South Wales, will take up his new appointment on the 15th inst.

Increased Shipping Tonnage at the Port of London.

During the first four months of this fiscal year from 1st April to 31st July, 14,807,606 N.R.T. of shipping arrived at and departed from the Port of London. This figure shows an increase of 10 per cent. over that for the corresponding period in 1947 (13,521,979) and represents 16 per cent. of the total shipping arriving at and departing from United Kingdom ports.

Improvements at the Port of Maracaibo.

Venezuela is to spend about £1,000,000 on improvements to the Port of Maracaibo, one of the most important petroleum shipping ports in the world. The work, to be carried out immediately, calls for the construction of a 2,000-ft. bulkhead, a new pier and warehouse, extension of the present coffee pier and extensive dredging. It is expected to take about 18 months to complete the building of the bulkhead.

New Port Proposed in New South Wales.

The appointment of a Royal Commission by the New South Wales and Victorian Governments to inquire into the development of the Port of Eden, New South Wales, has been proposed by Mr. T. Hollway, the Victorian Premier. It is suggested that the port should be developed to serve both States. Eden was used as a shelter during the recent war by liners and troopships, and is considered the best port between Sydney and Melbourne.

Shipbuilding in Australia.

According to Mr. H. P. Breen, director of the division of industrial development in the Australian Ministry of Postwar Reconstruction, Australia is anxious to encourage any shipbuilder from overseas who is interested in establishing a shipyard in the Dominion. Inducements are being offered to foreign capital to establish in Australia; these include a variety of concessions on taxes and a promise of being able to transfer profits from the country.

Night Navigation on the Rhine.

Night water traffic on the Lower Rhine is to be allowed again for the first time since the war. At present only up-stream navigation after dark on a 47 miles stretch from the Dutch border to Ruhr-port will be permitted. Downstream navigation during the night will still be banned because of reduced control over vessels due to the swift current. Work on clearing the river of obstructions is continuing and restrictions will be lifted from time to time as improvements are effected.

River Traffic Control by Radio.

The effectiveness of low-power frequency-modulated radio equipment for providing a communication network for the control of industrial river craft was recently demonstrated at trials conducted by the General Electric Company, Ltd., on the River Thames. It was shown that with a single well-sited low-power shore transmitter, there was ample signal strength for communication with craft anywhere between Richmond Bridge and well beyond the Nore lightship. Occasional fading, caused by bridges, etc., and extraneous noise were found to be negligible.

Harbour Improvements at Pittenweem.

Pittenweem Town Council have reached agreement with the Scottish Home Department on proposals for the improvement of the local harbour. It has been agreed to lengthen the pier with baffle walls on the seaward side of the proposed extension and not to erect storm gates until the results of the alterations are noted.

North Shields Improvement Scheme.

The Tyne Improvement Commission have announced their decision to proceed with the remodelling of the Coble Dene Yard at the Albert Edward Dock, North Shields. Work on the scheme started before the war, but had to be suspended in September, 1939. The work, which will take three years to complete, will include the extension of the fitting shop and the locomotive fitting shop, and the rebuilding of the masons' shed.

New Oil Port for Syria.

It is proposed to build a new port in north-west Syria as a terminal for the projected 30-inch pipe line, which, when completed, will appreciably increase the flow of Britain's oil supplies from Iraq. After spending many months inspecting various sites, the Iraq Petroleum Company has applied for permission to purchase the necessary land near the small Mediterranean coast town of Banias. Engineers expect the new port to be large enough to handle as many as 20 tankers at once.

Improvements at the Port of Belawan.

It is reported from Belawan, Deli (Sumatra, Dutch East Indies) that a dredger has been successfully operating in the Belawan Channel for some months past, and the depth of water is rapidly improving. As the dredger cannot operate alongside the wharf, a bucket dredger for this part of the work has been procured and is now operating alongside the palm oil berth at Godown 21/22. A crane with a capacity of 75 tons has also arrived to commence lifting the wrecks of two steamers, and there is every likelihood that towards the end of this year vessels will be able to enter the harbour and load and discharge at the buoys or even alongside the wharf if the same rate of progress can be maintained.

Use of Auxiliary Generating Plant.

The Ministry of Fuel and Power asks industrial and other undertakings which own auxiliary electrical generating plant to use it to relieve the public supply at least during the hours 8 a.m.-12 noon and 4 p.m.-5.30 p.m. from the beginning of October to the end of March. Some of the plant was supplied on condition that it was kept in continuous use during working hours. In order to save oil, the condition was waived during the summer, and for the coming winter the times set out above should be substituted for "continuous use." Owners of auxiliary plant are also asked to run the plant at other times if requested to do so by a Regional Board for Industry in connection with the electricity load spreading arrangements.

Shoreham Harbour Improvements.

Plans for the improvement of Shoreham Harbour in connection with the development of Southwick Power Station have been provisionally agreed between the Harbour Trustees and the British Electricity Authority. The scheme includes the following:—construction of a new lock, 360-ft. by 55-ft.; deepening of the canal to accommodate colliers of 4,500 tons; widening of the harbour entrance; extending the West Pier and construction of a new eastern breakwater; extending the width and depth of the canal at the harbour locks entrance. The plans, which have been prepared by Sir William Halcrow & Partners, consulting engineers to the British Electricity Authority, are to be submitted by the Harbour Trustees to Messrs. Rendel, Palmer & Tritton, consulting engineers, for advice.

The Port of Sydney

Excerpts from Annual Report

The accounts for the year ended 30th June, 1947, show a net surplus of £136,809 1s. 7d., which is a decrease of £91,717 18s. 9d. as compared with the previous year.

Income.—The net income earned during the year was £1,379,882 9s. 2d., and was less than the previous year by £40,304 12s. 6d.

Oversea Trade.—The Board's principal source of revenue is wharfage rates on overseas imports, and the revenue from this source for the year under review amounted to £311,254. This figure shows a decrease of £42,609 as compared with the previous year and was less than the pre-war year 1938-39 by £30,336.

The revenue from wharfage rates on goods shipped overseas amounted to £111,891, a decrease of £3,498 as compared with the figures for the previous financial year, but it is of interest to note that income from this source exceeded that collected during the pre-war year referred to above by £41,132.

Wheat exports eased during the early part of the year as the result of the failure of the New South Wales wheat crop, with the resultant loss of revenue from outward wharfage rates, but this was almost compensated for by the increased export of wool which resulted from the favourable post-war market which developed for that commodity.

Inter-State Trade.—The income from wharfage rates on imports from Inter-State ports amounted to £161,752 and was less than the previous year's figure by £33,159.

Recovery in this trade has been much slower than was anticipated and comparatively little improvement in the tonnage position occurred during the year.

Revenue Expenditure.—The expenditure chargeable against income amounted to £1,243,073 7s. 7d., being made up as follows: Working expenses, £757,158 14s. 6d.; Interest on capital debt, £389,662 2s. 10d.; Sinking fund contributions, £96,252 10s. 3d.

Capital Debt Account.—The capital debt account was increased during the year from £12,239,895 3s. 9d. to £12,393,749 13s. 6d. The increase was made by expenditure on "capital" work of £160,571 11s. 5d., less repayments amounting to £6,717 1s. 8d.

Trade and Shipping

Although there has been some indication of a return to normal trading during the latter part of the year, it is not anticipated that the forthcoming financial year will see the resumption of normal trading, owing to disturbed world trade conditions and the length of time taken to refit and return ships to commercial purposes after war service.

Shipping.—The volume of shipping which entered the Port of Sydney during the year, namely 10,123,199 tons (gross) when compared with the figures of the previous year, showed a decrease of 724,229 tons. The number of vessels making up the aggregate was 3,628 as compared with 3,671 for last year. The decrease in the number of oversea vessels can be compensated to some extent by the fact that the vessels now carry much larger cargoes. In fact, compared with the pre-war years, cargoes carried have practically doubled.

Trade of the Port.—Imports (including transhipment cargoes) totalled 4,875,200 tons and exports amounted to 2,605,060 tons, making a total of 7,480,260 tons for the year. The corresponding figures for last year were 5,398,218 tons, 2,599,570 tons and 7,997,788 tons respectively.

Navigation.—The characteristics of the navigation lights in the eastern and western channels of the port and at Shark Bay and Shark Island were altered during the year to conform with the International System of Lighting. Action is also being taken in this connection to alter and improve certain other lights in the port.

The introduction of larger flying boats into the overseas service necessitated arrangements being made whereby the waters of the port outside the Rose Bay Air Port could be used by aircraft when landing and departing.

A total of 1,062, comprising 526 inward and 536 outward trips were made by flying boats, and it became very necessary that precautionary measures be introduced to safeguard both the aircraft and shipping, particularly when the operations were carried out at night time.

Works and Improvements

Reconstruction of Wharfage at Pyrmont.—In conformity with the Board's policy of providing modern wharfage facilities to meet the growing demands of trade and shipping of the Port of Sydney, a commencement was made some years ago on the reconstruction of wharfage at Nos. 7 to 14 Pyrmont for use by the oversea trade.

With the transfer of the wheat handling operations from Pyrmont to Glebe Island, the old Nos. 3 to 10 berths, Pyrmont, were demolished and the new Nos. 9 and 10 berths were constructed, and provision was made for a further two berths to be known as Nos. 7 and 8.

Work on the new wharf at Nos. 7 and 8 berths was commenced in June, 1944, and was continued throughout the year under review. A new type of trestle sea wall has been designed for use in this construction.

Work has been continued on the reconstruction of Nos. 12-14 berths with a view to providing combined passenger and cargo wharves for the oversea trade and steady progress has been made until now there are three modern berths equipped with rail tracks, connected to the State Railway System, and two sheds, one at No. 12 berth and the other at No. 13 berth, the latter having been in use for some time.

The erection of the shed at No. 12 berth actually commenced on 4th April, 1945, and at the end of the year under review the building was completed, with the exception of the erection of the roller shutters. The dimensions of the new shed are 485-ft. by 102-ft. 6-in.

The upper floors of the shed are to be connected with the higher foreshore level by means of a bridge, which will facilitate the transport of passengers and their luggage to and from vessels berthed at the premises.

Remodelling of Wharfage in Darling Harbour.—The scheme prepared by the Board for the remodelling of wharfage in Darling Harbour between Nos. 6 and 34 berths, at an estimated cost of approximately £3,000,000, to provide modern premises for the Interstate and Intra-State trades was advanced a further stage recently when an area at Rozelle Bay, required by the Board for the establishment of a depot for the manufacture of pre-cast concrete piles, and other wharf units in connection with the work, was returned to the Board by the Commonwealth Government after having been under requisition for war purposes.

When the depot is in working order the concrete piles and other units manufactured on the site will be lightered to Darling Harbour and placed in proper positions by suitable plant to be acquired by the Board.

Shortage of manpower and plant have delayed the progress of the remodelling scheme beyond the planning stage, but it is hoped that conditions will improve in the near future to enable actual construction work to commence.

The Board has decided to acquire a new 30-ton floating crane, particularly to assist in this work, and arrangements have been made for a design to be prepared in order to permit of tenders being called.